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Hazardous Waste Management Problem Assessment and Strategy Formulation

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This report deals with Hazardous Waste Management in the State of Hawaii, Territory of Guam, Government of Northern Marianas, and the Trust Territory Islands of the Pacific. The report attempts to identify the types, quantities, and generators of hazardous waste. The report also makes projections of future solid waste generation, assesses the adequacy of present management practices, and presents alternatives for future management.

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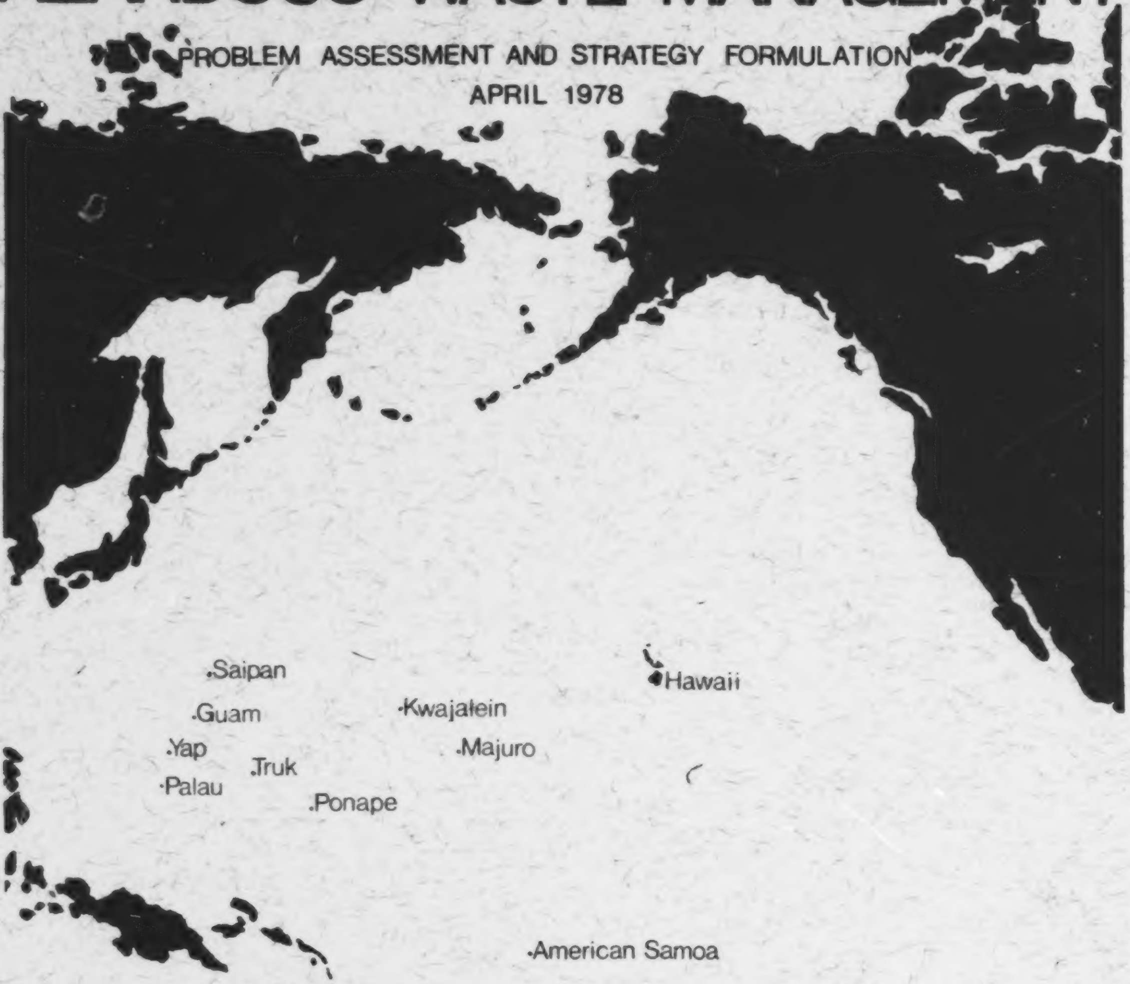
HAZARDOUS WASTE MANAGEMENT

PROBLEM ASSESSMENT AND STRATEGY FORMULATION

APRIL 1978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INTRODUCTION

Project Evolution

From 1970 to 1975, the State of Hawaii and the Territories of American Samoa, Guam, and the Trust Territory Islands of the Pacific were engaged in planning to regulate solid waste management. Such efforts were part of a nationwide action called for by the Solid Waste Disposal Act of 1965. In addition to management of domestic and commercial refuse, hazardous wastes emerged as a significant unregulated source of pollution. Several severe incidents of environmental pollution caused by the uncontrolled discharge of hazardous wastes had been reported in these areas. This led to a request to the U. S. Environmental Protection Agency (EPA) for assistance in planning and developing regulatory programs to manage hazardous wastes. The lack of resources within these agencies and existing similarities in relevant factors in the respective jurisdictions brought about a joint Federal-local effort.

In the spring of 1976, EPA developed a "Memorandum of Understanding" and a "Scope of Work" to which EPA and the local agencies subscribed. The EPA offered a planning grant and the State of Hawaii agreed to administer the grant for all parties. The plan of action called for the work to be accomplished through the mechanism of engaging a consultant. Request for proposals led to the selection of the firm of Garretson•Elmendorf•Zinov•Reibin, Architects and Engineers, of San Francisco, California.

The contract to initiate the study was let June 1977. During the course of work, the Northern Marianas Islands seceded from the Trust Territory Islands of the Pacific and formed the Commonwealth of Northern Marianas; Northern Marianas was therefore considered as a separate governmental jurisdiction for planning purposes.

Scope of Work

Objectives

Objectives of this study are:

- Provide an order of magnitude assessment of hazardous waste management problems in the Pacific Basin.
- Evaluate present handling and disposal practices.
- Recommend alternatives to practices considered environmentally unacceptable.
- Recommend an overall hazardous waste management strategy.

The study covers twelve Pacific Basin islands. These are:

- State of Hawaii (Oahu, Maui, Kauai, and Hawaii)
- Territory of Guam (Guam)
- Territory of American Samoa (Tutuila)
- Government of Northern Marianas (Saipan)
- Trust Territory Islands of the Pacific (Majuro, Palau, Ponape, Truk, and Yap)

Definition of "Hazardous Waste"

For purposes of this study, the term "hazardous waste" includes any refuse or discarded material or combinations of refuse or discarded materials in solid, semi-solid, liquid, or gaseous form which cannot be handled in a routine waste disposal method because they pose a substantial or potential hazard to man or other living organisms because of their chemical, biological, and physical properties. The study does not include warfare materials and nuclear materials. Hazardous wastes not excluded by the above definitions but arising from operations of industry, including agriculture (i.e., pesticide wastes and pesticide containers), commerce, domestic operations, non-warfare military operations, and whatever other source, are included to the extent the impacts may reasonably be considered significant. Dewatered sludges from water treatment plants and dewatered digested sludges from wastewater treatment plants are included.

Survey Methodology

To assess the magnitude of hazardous waste management problems a mail survey was conducted of over 1,300 relevant public agencies and private enterprises. The mailing list was generated from past survey mailing lists, directories of manufacturers, and local telephone directories. The questionnaire used for the bulk of the survey was provided by EPA. Individual questionnaires were generated and used in cases where the EPA questionnaire was not appropriate. Follow-up procedures included second mailings, telephone contact, and/or personal interviews. In addition, field investigations were conducted of the existing hazardous waste storage, treatment, processing, and disposal operations. Information provided herein is limited to data reported in survey questionnaires and that which was obtained during field investigations.

Report Presentation

The report is presented in five chapters, corresponding to each of the participating governments:

Chapter 1 - State of Hawaii

Chapter 2 - Territory of Guam

Chapter 3 - Territory of American Samoa

Chapter 4 - Government of Northern Marianas

Chapter 5 - Trust Territory Islands of the Pacific

Chapter presentations follow the tasks outlined in the Work Plan (refer to Appendix A).

- Task 1 identifies the types, quantities, and generators of hazardous wastes.
- Task 2 identifies waste quantities stored or retained from previous years.
- Task 3 presents projections of future hazardous waste generation.
- Task 4 describes and evaluates the adequacy of present hazardous waste management practices.
- Task 5 assesses the adequacy of present State or Territory laws and regulations and presents recommendations to correct deficiencies.
- Task 6 presents recommended alternatives for the proper management of those hazardous wastes not now managed in an environmentally acceptable manner and a strategy for overall management of hazardous wastes.

The report was prepared in this format so individual chapter reports could be issued separately to appropriate jurisdictions.

Summary of Project Findings and Recommendations

Findings

- All islands surveyed generate wastes which, if improperly managed, pose a significant threat to the extremely sensitive island environments.
- Each jurisdiction is temporarily storing wastes retained from previous years.

- Quantities of hazardous wastes are projected to increase in the future. However, this increase is not expected to significantly impact the magnitude of the problem or management practices necessary to protect human health and the environment.

- On all islands, certain hazardous wastes are not managed in an environmentally acceptable manner. Proper treatment and disposal facilities are limited and hydrogeologic conditions preclude siting of hazardous waste landfills without extensive engineered features.

- The Resource Conservation and Recovery Act of 1976 (PL94-580) requires EPA to establish and administer a nationwide hazardous waste management program. States and territories are allowed to implement a substantially equivalent program in lieu of the Federal program. If states and territories do not elect to administer the program, the Federal program will be put into effect and enforced by the EPA, Region IX office. In either case, military installations will be required to comply. Additions to existing laws and regulations would need to be promulgated to fulfill requirements for local program administration.

- Cooperative concepts between Pacific Basin governments for proper management of hazardous wastes are limited due to the configuration of shipping lines. It is generally less expensive for Guam, American Samoa, Government of Northern Marianas, and Trust Territory Islands of the Pacific to ship wastes to California than to Hawaii.

Recommendations

- Due to the quantities and types of hazardous wastes generated in each jurisdiction, it is recommended a comprehensive management program be instituted. Either the Federal program as established in PL94-580 or a substantially equivalent local program will suffice.

- Hazardous wastes retained from previous years which are currently held in government storage should be collected and disposed. Private enterprises storing such wastes should be encouraged to do the same. Continued storage is regarded as a significant potential hazard.

- In order to reduce the magnitude of hazardous waste management problems in the Pacific Basin, the State and Territories should require government agencies and encourage military installations and private enterprises to institute measures to reduce and reuse hazardous wastes generated.

- To properly manage wastes which cannot be eliminated through waste reduction and reuse measures, and wastes treated and disposed via existing facilities, it is recommended:

  (1) The State of Hawaii should investigate siting a hazardous waste landfill, specialized transfer stations, and petroleum waste land farm.

  (2) The Territory of Guam should consider future needs for disposal of small quantities of hazardous wastes when siting a landfill to replace the Ordot landfill.

  (3) The other territories should give consideration to developing a limited hazardous waste landfill for disposal of those wastes not considered extremely hazardous. Extremely hazardous wastes should be shipped off-island for proper disposal.

- Future industrial development should recognize the limitations of local disposal capabilities and make adequate provisions for management of their hazardous wastes.

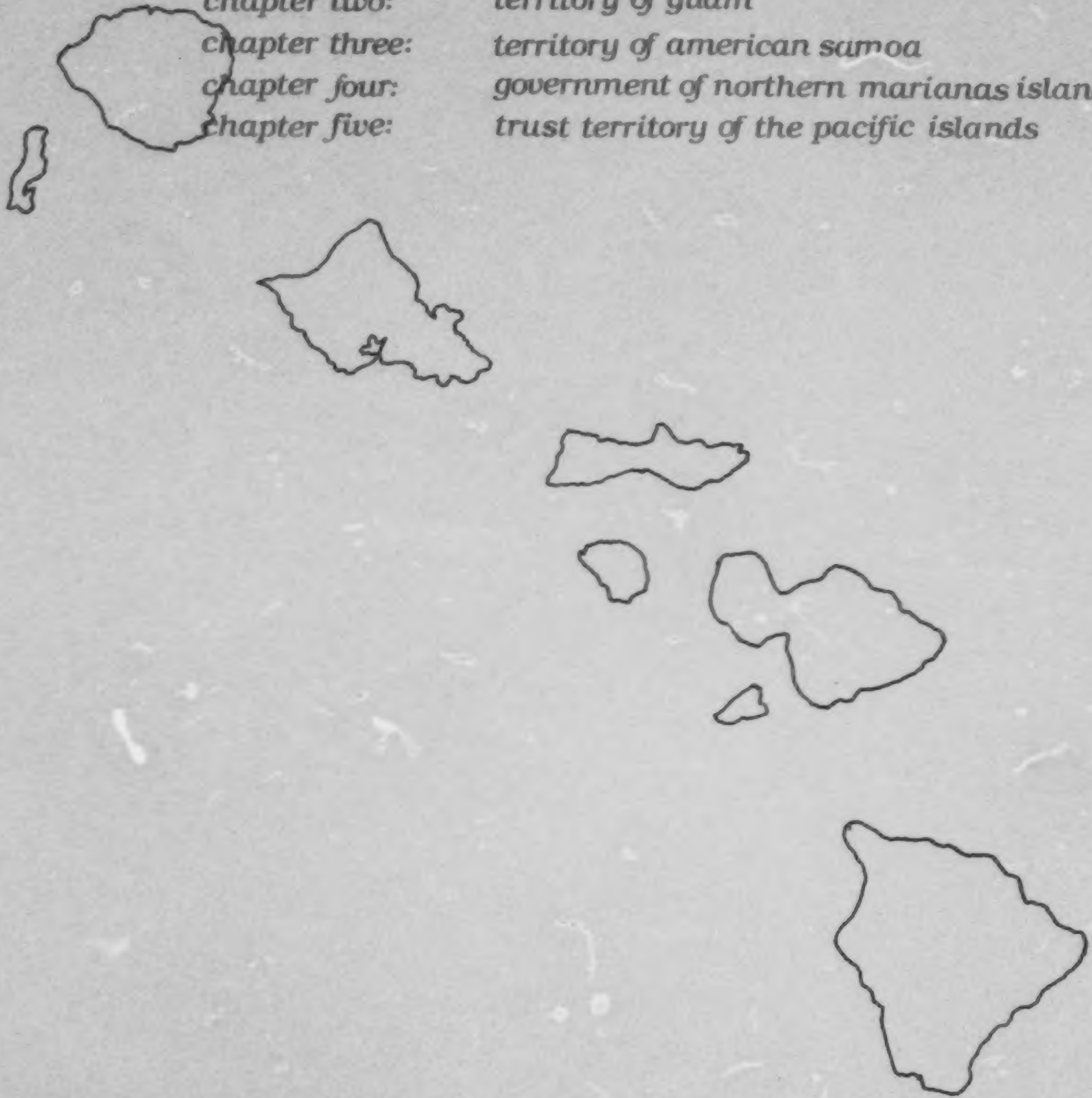
PREPARED FOR

HAWAII • GUAM • AMERICAN SAMOA • NORTHERN MARIANAS ISLANDS •
TRUST TERRITORY ISLANDS

HAZARDOUS WASTE MANAGEMENT

PROBLEM ASSESSMENT AND STRATEGY FORMULATION

chapter one: state of hawaii
chapter two: territory of guam
chapter three: territory of american samoa
chapter four: government of northern marianas islands
chapter five: trust territory of the pacific islands



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INTRODUCTION

Background

Hawaii is the nation's only state comprised entirely of islands. Its land area is 16,700 square kilometers (6,425 square miles), 47th in size among all states. Eight major islands and 124 minor islands are a part of the state, extending 2,437 kilometers (1,523 statute miles) from tip to tip. The major islands, in order of size, include Hawaii, Maui, Oahu, Kauai, Molokai, Lanai, Niihau, and Kahoolawe (Reference 1).

The islands are volcanic in origin, with sharp contrasts in topography. Roughly 12 percent of total land area is too steep for development or lacks productive capacity. The climate is moderate with little seasonal variation. The annual temperature average is 24°C (75°F). August and September, with average temperatures of 26°C (78°F), are the warmest months; the coolest month is February, with an average temperature of 22°C (71°F). Rainfall generally ranges from 50 centimeters (20 inches) annually in the lowest area to 463 centimeters (185 inches) in the mountains (Reference 1).

Hawaii's economy is composed of three basic activities: tourism and service related activities; military; and agriculture. Eighty percent of the state's population (approximately 720,000 in 1977; Reference 2) and commerce occurs on the island of Oahu. Food processing, including sugar, pineapple, and fruit juices, represents the largest manufacturing activity. In heavy manufacturing there are two oil refineries producing a wide range of petroleum products; two cement plants; a steel mill for reinforcing rods; and 19 concrete products plants (Reference 3).

Summary of Chapter Findings and Recommendations

Hazardous waste generation and management practices were analyzed by reviewing past reports and conducting extensive field surveys of industrial and commercial enterprises and public agencies on the islands of Oahu, Maui, Kauai, and Hawaii.

TASK 1 IDENTIFICATION OF CONDITIONS

- Hazardous wastes generated in the State of Hawaii are diverse and quantities significant.

- If improperly managed, these wastes pose a significant threat to human health and environment, primarily through contamination of ground and surface waters.

TASK 2 STORAGE

The following principal types of hazardous wastes are currently held in storage:

- Contaminated solvents
- Cyanide wastes
- Fluids containing PCB's
- Heavy metal sludges
- Suspended and unusable pesticides

TASK 3 PROJECTIONS

Quantities of hazardous wastes are projected to increase in the future. This increase is not expected to significantly change the magnitude of the problem or the management practices necessary to protect human health and the environment. However, a facility for processing modules collected from the ocean bottom has been proposed for the Island of Hawaii by the State Planning and Economic Development Department (Science Policy and Technology Assessment). Such processing will generate a large quantity of hazardous wastes. Types and quantities are as yet undetermined.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

Hazardous wastes which are currently managed in an environmentally unacceptable manner are:

- Acids/alkalies
- Asbestos dust
- Cyanide wastes
- Dye/ink wastes
- Expired and unusable medicines
- Fluids containing PCB's
- Heavy metal sludges
- Lime slurry
- Mercuric nitrate
- Oily water

- Oil sludge/tank bottom sludge
- Paint-contaminated soil and sand
- Pathological/infectious wastes
- Refinery catalysts
- Spent pesticide containers
- Spent photo chemicals
- Suspended and unusable pesticides
- Used solvents
- Waste oil

Local facilities are not adequate to treat and dispose of all these wastes. Wastes unmanageable locally are generated in sufficient volume to justify detailed investigation of a hazardous waste landfill and petroleum waste land farm.

TASK 5 LAWS AND REGULATIONS

The Resource Conservation and Recovery Act of 1976 (PL94-580) requires the Federal Environmental Protection Agency (EPA) to establish and administer a nationwide hazardous waste management program. States and territories are allowed to implement a substantially equivalent program in lieu of the Federal program. If the state does not, the Federal program will be put into effect and enforced by the EPA, Region IX office. Additions to existing regulations would need to be promulgated to fulfill requirements for State administration under PL94-580.

TASK 6 RECOMMENDED STRATEGY

The following recommendations provide for the proper management of hazardous wastes:

- Practices which are identified as environmentally acceptable should be continued.
- Acids and alkalies should be neutralized before disposal. Heavy metal and noxious sludges require disposal at a hazardous waste landfill.
- Asbestos dust should be collected with industrial vacuums, stored in airtight, labelled, double plastic bags, and transported to a local landfill by the generator. The landfill operator should take care not to puncture the container during separate burial.

- Cyanide wastes should be treated at the Navy's Industrial Waste Treatment Plant. Otherwise, they will require pretreatment on-site with sludge disposal at a hazardous waste landfill.
- Dye and ink wastes should be filtered on-site for reuse or disposed at Energy Recovery Systems' liquid waste incinerator with the addition of air emission controls.
- Expired and unusable medicines should be returned to manufacturers if possible. Incineration, sewering, and landfilling are acceptable alternatives. Disposal requires a case-by-case decision.
- Heavy metal sludges and mercuric nitrate require disposal at a hazardous waste landfill.
- Lime slurry should be recovered if possible. If landfilled, slurry should first be dried by ponding to prevent localized leaching when buried.
- Materials containing PCB's require disposal at an EPA approved facility.
- Oily water should be processed for oil reclamation. Incineration or disposal at a petroleum waste land farm are acceptable alternatives.
- Oily sludge and tank bottom sediments should be disposed of at a petroleum waste land farm.
- Paint-contaminated blasting sand and soil require disposal at a hazardous waste landfill. Measures can be taken to reduce quantities generated.
- Pathological and infectious wastes should be disposed as recommended in Section 6B.9.
- Refinery catalysts should be recycled. If not, disposal at a hazardous waste landfill is required.
- Spent pesticide containers must be triple-rinsed, punctured, and crushed, prior to burial at local sanitary landfills, in accordance with State regulations. Unrinsed containers require disposal at a hazardous waste landfill.
- Spent photo chemical disposal to the sewer system must meet sewer code requirements. If not, pretreatment is required.
- Used solvents should be reclaimed locally. Acceptable alternatives are incineration at ERS or reclamation in California.

- Suspended and unusable pesticides require disposal at a hazardous waste landfill or incineration at an approved facility on a case-by-case basis. Storage prior to disposal should be in tightly closed containers in a cool, dry, secured area, with adequate ventilation.

- Waste oil is reclaimable and recovery should be given highest priority. Sufficient capacity exists to use all waste oil generated as a supplemental fuel. Road dusting with waste oil does not constitute reclamation and can be deleterious to ground and surface water quality. It should be prohibited.

Specific strategy recommendations are:

- Encourage waste reduction, separation, and reutilization to reduce the quantities of hazardous wastes requiring disposal.

- Negotiate an interagency agreement with the military to permit the free flow of wastes to existing hazardous waste treatment and disposal facilities.

- Investigate and implement, if feasible, the siting and operation of specialized transfer stations, a hazardous waste landfill, and petroleum waste land farm.

- Encourage Energy Recovery Systems to develop its facility to fullest potential. Additions of an afterburner and scrubber to the existing liquid waste incinerator will permit treatment and disposal of chlorinated and fluorinated wastes. Strict enforcement of standards and guidelines for proper hazardous waste disposal will significantly increase quantities requiring incineration, thereby making the additional capital investment more attractive.

- Collect and dispose of all excess governmentally held suspended and unusable pesticides. Continued storage is regarded as a significant potential hazard.

TASK 1 IDENTIFICATION OF CONDITIONS

1A A Review and Summation of Existing Reports on Hazardous Wastes

Documentation on hazardous waste management practices in the State of Hawaii was reviewed to establish an investigative data base. This material afforded parameters for identifying some wastes and analyzing certain management practices.

1A.1 Solid Waste Management Plan for the City and County of Honolulu (Reference 4)

Potentially hazardous wastes reported as requiring special handling included:

- Pathological and infectious wastes
- Sewage sludge
- Suspended or unusable pesticides
- Petroleum wastes

The following paragraphs summarize discussion in the 1971 plan. More specific information on generators, waste types, quantities, and/or management practices was not reported.

Pathological and infectious wastes are purportedly rigidly controlled in hospitals and medical offices. These materials were reported sterilized on-site or transported to the nearest hospital with sterilization equipment. Quantities were unknown in 1971. Processing facilities are regulated by the State Department of Health.

Sewage sludge was reported going to local landfills. Oahu's potential 1975 sludge generation (assuming Sand Island Treatment Facility is operating) was estimated at 15,440 metric tons (17,150 English tons).

Unusable pesticides and herbicides were reported dispersed over the ground after dilution or landfilled in original containers. In 1970, 10,980 kilograms (24,150 pounds) of herbicides and DDT on Oahu were placed in temporary storage. These products were restricted from use subsequent to manufacture. It was suggested these may require shipment off Oahu for disposal.

Waste oil and oil sludges (3,040,000 liters/800,000 gallons per year) were reported collected from service stations and refineries. Small amounts were reprocessed. The remainder went to land disposal sites. Most ships were reported pumping oily bilge waters into the ocean. Burning waste oils in controlled furnaces was recommended.

A single agency to supervise hazardous wastes and licensing of users of toxic materials was recommended. It was suggested new disposal methods for hazardous wastes be investigated.

1A.2 Reports Issued by the Health Department's Advisory Committee on Hazardous Waste Disposal/Federal Executive Board

(References 5 and 6)

The following information encapsulates findings of two studies conducted in 1974 by the Hawaiian government. More specific information on generators, waste types, quantities, and management practices was not reported. The Health Department's Advisory Committee on Hazardous Waste Disposal surveyed the major industrial categories in the state. The Federal Executive Board investigated military and governmental waste generators.

Petroleum wastes were recognized as a major concern because of their deleterious effect upon the environment. Approximately 760,000 liters (200,000 gallons) of oil, oil-water emulsions, and oily water were reported collected monthly. Hawaiian Electric Company was reported receiving 190,000 liters (50,000 gallons) of these wastes every month and using them as an energy source. The remaining oil waste was reported to have a variety of destinations,* none of which were considered entirely satisfactory from an environmental standpoint.

Sludge wastes from the bottoms of leaded gasoline storage tanks represented a second major problem. The organo-lead materials found in this sludge are highly corrosive. When studied, there were no facilities reported which could handle this waste.

Several gallons of photographic and printing wastes were reported generated weekly. Silver recovery and incineration were recommended. Most of these wastes, when studied, were being diluted and disposed to the sewer.

Toxic organic and inorganic chemicals were reported accumulated and not disposed of when generated. Such accumulation was problematic because of its bulk. Some chemicals were reported mixed in storage.

Acids and caustics were reported neutralized and disposed through the sewer system, eventually into the ocean. The Air Force was reported generating 141 liters (37 gallons) of acid monthly, and the Army 992 liters (261 gallons) monthly.

Pathological and infectious wastes studied included syringes, dressings, and carcasses. These wastes are generated by hospitals and veterinary clinics and require special handling. Disposal methods included incineration and landfill disposal, occasionally with autoclaving prior to collection.

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* Sewer system, storm drains, ground, road dusting.

The Navy considers fluorescent tubes hazardous because of phosphorous and mercury content. Disposal of an undetermined number was reported accomplished by distribution to various landfills. Recycling was recommended.

During these studies, there was 19,500 kilograms (43,000 pounds) of DDT stockpiled in Hawaii. Navy storage comprised 5,900 kilograms (13,000 pounds). Commercial chemical companies were storing the other 13,600 kilograms (30,000 pounds). No approved disposal methods were reported.

Used solvents were reported produced at 15,300 liters (4,000 gallons) per month by the Air Force and 17,800 liters (4,700 gallons) per month by the Army. The Navy had accumulated 28,000 liters (7,400 gallons) at the time of study. Waste solvents had been burned or incinerated.

Oxidizers and reducers (photo chemical and laundry bleaches) were reported generated at 942 liters (249 gallons) per month by the Air Force and 91 kilograms (200 pounds) per month by the Army. Wastes were reported diluted and sewered.

The Army reported generating 300 spent containers of insecticide, vermicide, and herbicide per month to municipal collection. No other agencies reported generating spent toxic materials containers.

The Navy reported producing some special wastes* from submarines and new fire extinguishing agents, particularly the chemicals in Aqueous Film Forming Foam (AFFF). Disposal methods were being investigated by the Navy.

General recommendations included institutionalizing recycling procedures to reduce hazardous waste quantities, developing hazardous materials inventories for civilian agencies similar to those used by defense agencies, and specific investigation of problems requiring case-by-case solution. The Federal Executive Board supported the concept of a Consolidated Hazardous Items List (CHIL). The CHIL was prepared by the Navy and describes methods for disposal of over 3,900 items.

1A.3 Disposal of Hazardous Wastes at Military Installations (Reference 7)

In 1975 a study of hazardous waste disposal at military installations was completed by an in-house military sub-study group. Report findings are summarized in Table 1-1. More specific information on generators,

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* Solutions of EDTA and hydrazine (submarine boiler tube cleaning) - 3,800 liters (1,000 gallons) per month; solutions of mercuric nitrate (water sampling waste) - 190 liters (50 gallons) per month; rags contaminated with Otto fuel.

TABLE 1-1 - SUMMARY OF MILITARY HAZARDOUS WASTE GENERATION - HAWAII - 1975 (SHEET 1 OF 3)

Disposal Means and Type of Waste	Annual Quantity (Liters/Gallons)							
	Navy		Army		Air Force		Marine Corps	
	Metric	English	Metric	English	Metric	English	Metric	English
Acids and Caustics								
• Sanitary Sewer	41,000	10,800	8,400	2,200	1,940	510	910	240
• Storm Drain	56,200	14,800	70**	160**	11**	25**	38	10
• Shipped to Navy Industrial Waste Treatment Plant	316,200 6**	83,200 13**	38	10	1,900	500		
• Ground Surface or Pit	14,100	3,600	4,450	170			1,410	370
• Other							910	240
Alkalies								
• Shipped to Navy Industrial Waste Treatment Plant	126,200 5**	33,200 10**						
• Storm Drain	85,100 5**	22,400 10**	18**	40**	38 11**	10 25**		
• Sanitary Sewer	16,300	4,300	610	160	460	120		
• Evaporation	190	50	150 5**	40 10**				
• Storage					650	170		
Biological/Pathological*								
• Landfill	5,300 Items				6,000 Items			
Chromium Wastes								
• Shipped to Navy Industrial Waste Treatment Plant	6,800	1,800	11**	25**				
• Storm Drain	230	60						
• Sanitary Sewer	80	20						
• Landfill	11	3						
Detergents								
• Ground					1,140	300		
• Sanitary Sewer	20,100 4,360**	5,300 9,600**	760 36,400**	200 80,100**	73,000 3,910**	19,200 8,600**	19,800 2,730**	5,200 6,000**
• Storm Drain -	50,200 1,640**	13,200 3,600**	190	50			26,200 1,640**	6,900 3,600**
• Shipped to Navy Industrial Waste Treatment Plant	28,100	7,400						

* Reference 7; more specific information on generation activity, waste types, quantities, and management practices were not reported.

** Quantities shown in kilograms/pounds.

*** Bacteria cultures, carcasses, and tissues.

TABLE 1-1 - SUMMARY OF MILITARY HAZARDOUS WASTE GENERATION - HAWAII - 1975 (SHEET 2 OF 3)

Disposal Means and Type of Waste	Annual Quantity (Liters/Gallons)							
	Navy		Army		Air Force		Marine Corps	
	Metric	English	Metric	English	Metric	English	Metric	English
Disinfectants								
• Sanitary Sewer	250 5**	65 10**	1,070 1,320***	280 2,900***	1,980 23**	520 50**		
• Evaporation	130	35						
• Shipped to Suitable Place	110	30			1,900	500		
• Storm Drain	38	10						
Explosives								
• Shipped to Army Makua Valley Demolition Site	150 Items		130,900**	288,000**				
Fertilizers								
• All Consumed	All		All		All		All	
Infectious Medical Wastes******								
• Landfill	14,000 Items		100 Items		92,000 Items		100,300 Items 500**	1,100**
• Incinerator	500 Items		76,600 Items 91**	200**				
Inorganic Materials								
• Consumed or Returned to Manufacturer			9**	20**	140**	300**		
• Shipped to Navy Industrial Waste Treatment Plant	14**	30**						
• Landfill	110**	250**						
Miscellaneous								
• Storm Drain	23,200 11**	6,100 250**					6,194,000 1,360**	1,630,000***** 3,000**
• Ground	12,500 1,140**	3,300 2,500**	45**	100**			1,100**	2,400**
• Landfill	55** +600 Items	120**						
• Shipped to Suitable Place	122,000	32,000	610	160				
• Awaiting Disposal	10,600 1,140**	2,800 2,500**						
• Sanitary Sewer			3,800 3,400**	1,000 7,500**			12,500	3,300

* Reference 7; more specific information on generation activity, waste types, quantities, and management practices were not reported.

** Quantities shown in kilograms/pounds.

*** Chlorine bleach; quantities in kilograms/pounds.

**** Dressings and needles.

***** Steam plant blowdown, pool filter backwash, and engine test cell.

TABLE 1-1 - SUMMARY OF MILITARY HAZARDOUS WASTE GENERATION - HAWAII - 1975 (SHEET 3 OF 3)

Disposal Means and Type of Waste	Annual Quantity (Liters/Gallons)							
	Navy		Army		Air Force		Marine Corps	
	Metric	English	Metric	English	Metric	English	Metric	English
Pesticides/Herbicides								
• All Consumed or Stored	All		All				All	
Petroleum Products								
• Shipped to Navy Oil Reclamation Center or Energy Recovery Systems	23,900,000	6,282,000	285,800	75,200	97,700	25,700	13,700	3,600
	110**	240**						
• Ground	89,700	23,600	1,750	460	1,710	450	49,400	13,000
	23**	50**	70**	150**				
• Landfill	1,900	500						
• Sanitary Sewer	38	10						
• Storm Drain	38	10			1,140	300		
Photographic/Printing Solutions								
• Sanitary Sewer	56,200	14,800	32,700	8,600	411,200	108,200	3,200	800
• Silver Recovery Effluent	25,100	6,600			182,400	48,000		
• Shipped to Suitable Place	14,400	3,800						
• Ground	8	2						
• Cesspool	1,500	400						
Sludges								
• Landfill	1,520	400	1,900	500				
	5**	10**						
Solvents								
• Ground	56,200	14,800	4,900	1,300	2,550	670	54,000	14,200
• Shipped to Energy Recovery Systems	30,000	7,900	33,300	19,300	113,600	29,900		
• Storm Drain	28,100	7,441	3,800	100				
• Sanitary Drain	300	80	460	120	760	204		
Spent Pesticide and Chemical Containers								
• Incineration	40 Items							
• Landfill			600 Items		248 Items			
Strong Oxidizers and Reducers								
• Sanitary Sewer			1,270**	2,800**	150	40		
• Storm Drain	1,140	300						
	3,100***	6,800***						
• Landfill	65 Items							
• Shipped to Navy Industrial Waste Treatment Plant	5**	10**						

* Reference 7; more specific information on generation activity, waste types, quantities, and management practices were not reported.

** Quantities shown in kilograms/pounds.

*** Chlorine bleach; quantities in kilograms/pounds.

waste types, quantities, and management practices was not reported. The inventory reveals a sizable amount and variety of hazardous wastes are generated by the military on Oahu. While treatment facilities exist with adequate capacity, designed specifically to treat certain types of hazardous wastes, it was reported many activities were discharging wastes into storm and sanitary sewers and elsewhere in violation of environmental regulations. It was suggested these violations were attributable to lack of environmental awareness and absence of aggressive management and personnel actions. A more complete evaluation of military hazardous waste management practices as discussed in Reference 7 appears in Appendix E.

It was recommended new procedures be instituted to assure:

- Proper disposal of hazardous wastes.
- Each service fully utilizes existing specialized treatment facilities and services.
- Wastes for which treatment/disposal facilities are unavailable be stored properly until disposal is practicable.

Since this military report, both the Navy and Army have commissioned follow-up studies to be completed sometime in 1978. The Navy study is being conducted by the Exxon Corporation, while the Army study is being conducted by Garretson•Elmendorf•Zinov•Reibin, Architects and Engineers.

1A.4 Health Department Survey of Medical Service Facilities (Reference 8)

A survey of medical service facilities was initiated in 1975 by the Pollution Investigation and Enforcement Branch of the State Department of Health. The survey purpose was to obtain information on methods used to render pathological and infectious wastes safe prior to removal from facility grounds. Wastes under consideration were:

- Isolation ward wastes - formite and garbage
- Surgical specimens
- Laboratory wastes - bacteria cultures, urine, stool, blood, and biopsy specimens.
- Sharps - needles and syringes.
- Test animals

A majority of hospital facilities was included in the survey.

The conclusions and recommendations of this report were as follows:

> "In-house handling of infectious waste is satisfactory, but the storage of waste prior to removal is not, for example: waste collected in plastic bags or cardboard boxes are stored in refuse bins. These bins do not prevent animals and scavengers from gaining access to the contaminated waste. Majority of these wastes are collected in compactor trucks and when the contained waste is compacted, the container can break open and the infectious waste can be exposed."

Recommendations included:

> "1. All infectious and pathological wastes should be incinerated or sterilized at the point of generation."
>
> "2. If contained waste is to be allowed, it should not be disposed in a compactor. It should be identified and collected separately and taken directly to an approved solid waste disposal facility."
>
> "3. Agencies responsible for the licensing of these facilities should adopt regulations or guidelines for storage and disposal of infectious and pathological wastes."

1B Expected Types of Hazardous Wastes

Based on a review of the studies previously summarized, and literature concerning the generation of hazardous waste from industrial facilities (Reference 9), major types of hazardous wastes expected to be found in Hawaii are presented in Table 1-2.

1C Potential Hazardous Waste Generators

Potential major hazardous waste generators in the State are:

- Airport facilities
- Bulk distribution plants - petroleum products
- Chemical/gas/fertilizer manufacturers
- Chromium plating works
- Construction industry
- Gas stations/garages
- Governmental agencies

- Grain mill product producers
- Hospitals/medical laboratories
- Jewelry manufacturers
- Military installations
- Painters
- Pest control industry
- Plantations and diversified agriculture
- Power generating facilities
- Printers/publishers/photo developers
- Refineries
- Shipyards
- Silk screeners
- Steel galvanizers
- University
- Wood treating industry

Individual firms were identified from previous hazardous waste survey mailing lists (Reference 5), the Directory of Manufacturers, State of Hawaii (Reference 10), and local telephone books. A list of government agencies was obtained from the Pollution Technical Review Branch of the State Health Department.

1D Survey Methodology

All firms, agencies, and universities were surveyed by mail to determine types and quantities of hazardous wastes generated and management procedures. For those not responding, second mailing, telephone contact, and/or personal interviews were utilized as follow-up procedures. The mailing list, identifying specific generators, was delivered to the Pollution Technical Review Branch of the State Health Department. This material was omitted from this report because of its volume.

TABLE 1-2

EXPECTED TYPES OF HAZARDOUS WASTES

Source	Type
Agricultural	• Spent Pesticide Containers • Spent Pesticide Solutions • Suspended and Unusable Pesticides
Governmental	• Digested Sewage Treatment Sludge • Expired and Unusable Medicines • Miscellaneous Chemical Wastes • Pathological/Infectious Wastes • Petroleum Wastes • Spent Pesticide and Chlorine Containers • Suspended and Unusable Pesticides • Used Solvents
Industrial/Commercial	• Acids • Alkalies • Contaminated Soil and Sand • Dye/Ink Wastes • Expired and Unusable Medicines • Inorganic Wastes • Pathological/Infectious Wastes • Petroleum Wastes • Sludges • Spent Pesticide Containers • Spent Photo Chemicals • Suspended and Unusable Pesticides • Used Solvents
Military	• Acids • Alkalies • Contaminated Soil and Sand • Chromium Wastes • Dye/Ink Wastes • Inorganic Wastes • Pathological/Infectious Wastes • Petroleum Wastes • Sludges • Spent Pesticide and Chlorine Containers • Spent Photo Chemicals • Strong Oxidizers and Reducers • Suspended and Unsuable Pesticides • Used Solvents

1E Generation Rates

Tables 1-3 and 1-4* summarize types and quantities of hazardous wastes reported.

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* Military quantities were obtained from Armed Services Study (Reference 7).

TABLE 1-3 - HAZARDOUS WASTE GENERATION - OAHU 1977 (SHEET 1 OF 2)

Hazardous Waste*	Source	Annual Quantity	
		Metric	English
Acids (Liters/Gallons)	Jewelry Manufacturers Steel Galvanizers Grain Mill Products	513,000	135,000
	Military Installations	445,000	117,000
	Total	958,000	252,000
Acid Sludge (Liters/Gallons)	Military Installations	1,900	500
Alkalies (Liters/Gallons)	Jewelry Manufacturers Grain Mill Products Steel Galvanizers	53,200	14,000
	Military Installations	228,000	60,000
	Total	281,200	74,000
Biological Sludge (30% Lime) (Liters/Gallons)	Refineries (Effluent Oxidation Ponds)	1,178,000	310,000
Catalyst (Metric/English Tons)	Refineries	250	280
Chromium Wastes (Liters/Gallons)	Military Installations	6,800	1,800
Damaged Substation Capacitors (Containing PCB Contaminated Hydraulic Fluid)	Power Generating Facilities	16 - 20 Items	
Digested Sewage Sludge (Meters/Yards)	Waste Water Treatment Plants	645	850
Dye/Ink Wastes (Liters/Gallons)	Printers/Publishers	38,000	10,000
	Military Installations	3,800	1,000
	Total	41,800	11,000
Expired and Unusable Medicines (Kilograms/Pounds)	Hospitals	2,000	4,400
Heavy Metal Sludge (Cubic Meters/Yards)	Wood Treating Industry Power Generating Facilities Waipaha Incinerator (Wastewater treatment facilities)	2,830	3,700
Inorganic Wastes	Jewelry Manufacturers Chromium Platers Brake/Pipe Repair Military Installations		
• Cyanide Compounds (Liters/Gallons)		3,800	1,000
• Asbestos (Kilograms/Pounds)		2,800	6,000
• Miscellaneous (Kilograms/Pounds)		280	600
	Total (Liters/Gallons)	3,800	1,000
	(Kilograms/Pounds)	3,080	6,600
Lime Slurry (Calcium Hydroxide) (Metric/English Tons)	Acetylene Producers	1,080	1,200
Oil Sludge (Liters/Gallons)	Refineries/Shipyards	950,000	250,000
	Military Installations	1,900	500
	Total	951,900	250,500
Oily Water (Liters/Gallons)	Ship Bilge Water City/County Bus Terminal	7,334,000	1,930,000
Paint Contaminated Soil and Sand (Bottom Blasting Operations) (Metric/English Tons)	Shipyards	670	740

TABLE 1-3 - HAZARDOUS WASTE GENERATION - OAHU 1977 (SHEET 2 OF 2)

Hazardous Waste*	Source	Annual Quantity Metric	Annual Quantity English
Pathological/Infectious Wastes (Tissues, Laboratory Wastes, Sharps, Test Animals, and Isolation Ward Wastes	Hospitals	15,000 Kg	33,000 Lb
	Public/Private Laboratories	23,000 Ltr	6,000 Gal
	Military Installations	295,000 Items	
		700 Kg	1,600 Lb
		5,300 Ltr	1,400 Gal
	Total (Items)	295,000 Items	
	(Kilograms/Pounds)	15,700	34,600
	(Liters/Gallons)	28,300	7,400
Pesticide Containers (Paper, Glass, Metal, Plastic)	Plantations/Diverse Agriculture Governmental Agencies Industrial/Commercial Enterprises	50,000 Items	
	Military Installations	1,000 Items	
	Total	51,000 Items	
Photo Chemicals (Spent Solutions) (Liters/Gallons)	Printers/Publishers Photo Developers	228,000	60,000
	Military Installations	726,000	191,000
	Total	954,000	251,000
Solvents (Liters/Gallons)	Printers/Publishers Garages Painters Silk Screeners Fabric Cleaners Miscellaneous Industry	380,000	100,000
	Military Installations	365,000	96,000
	Total	745,000	196,000
Spent Clay (Filter Media) (Metric/English Tons)	Refineries	45	50
Spent Seed Treatment Solution (99% Water, .9% Cane Trash, .01% Benlate) (Liters/Gallons)	Sugar Plantations	1,900,000	500,000
Strong Oxidizers and Reducers (Photo Chemicals and Laundry Bleach) (Kilograms/Pounds)	Military Installations	4,400	9,600
Tank Bottom Sediments (Oil Contaminated Soil, Sand, and Rust Particles) (Metric/English Tons)	Refineries Bulk Distribution Plants (Petroleum Products)	45	50
Tetraethyl Lead Sludge (Kilograms/Pounds)	Refineries Bulk Distribution Plants (Petroleum Products)	4,100	9,000
Waste Oil (Liters/Gallons)	Motor Vehicles Power Generating Facilities Honolulu International Airport Bulk Distribution Plants (Petroleum Products) Industrial Equipment Coast Guard	9,120,000	2,400,000
	Military Installations	25,255,000	6,646,000
	Total	34,375,000	9,046,000

TABLE 1-4 - HAZARDOUS WASTE GENERATION - HAWAII, KAUAI, AND MAUI, 1977 (SHEET 1 OF 2)

Hazardous Waste Material	Source	Annual Quantity (1977)					
		Hawaii		Kauai		Maui	
		Metric	English	Metric	English	Metric	English
Acids/Alkalies (Liters/Gallons)	Jewelry Manufacturers	2,600	700	0	0	4,560	1,200
Digested Sewage Sludge (Cubic Meters/Feet)	Wastewater Treatment Plants	40	1,300	20	800	0.14	5
Dye/Ink Waste (Liters/Gallons)	Printers/Publishers	3,800	1,000	1,900	500	3,000	800
Expired and Unusable Medicines (Kilograms/Pounds)	Hospitals	320	700	180	400	180	400
Heavy Metal Sludge (Cubic Meters/Yards)	Wood Treating Industry Power Generating Facilities	150	200	75	100	115	150
Inorganic Wastes							
• Cyanide Compounds (Liters/Gallons)	Jewelry Manufacturers	190	50	0	0	150	40
• Asbestos (Kilograms/Pounds)	Brake/Pipe Repair	270	600	135	300	225	500
Oily Water (Liters/Gallons)	Ship Bilge Water	285,000	75,000	0	0	0	0
Pathological/Infectious Wastes Kilograms/Pounds; Liters/Gallons)	Hospitals	3,400 4,900	7,400 1,300	1,800 2,700	3,900 700	2,000 3,000	4,400 800
Pesticide Containers (Paper, Glass, Metal, Plastic)	Plantations and Diverse Agriculture Governmental Agencies Industrial/Commercial Enterprises	27,600 Items		6,000 Items		37,700 Items	
Photo Chemicals (Spent Solutions) (Liters/Gallons)	Printers/Publishers	3,800	1,000	1,100	300	3,400	900
Solvents (Liters/Gallons)	Printers/Publishers Painters Garages Fabric Cleaners	22,800	6,000	7,600	2,000	15,200	4,000

TABLE 1-4 - HAZARDOUS WASTE GENERATION - HAWAII, KAUAI, AND MAUI, 1977 (SHEET 2 OF 2)

Hazardous Waste Material	Source	Annual Quantity (1977)					
		Hawaii		Kauai		Maui	
		Metric	English	Metric	English	Metric	English
Spent Seed Treatment Solutions (99% Water, .9% Cane Trash, .01% Benlate) (Liters/Gallons)	Sugar Plantations	1,300,000	340,000	115,000	30,000	2,830,000	745,000
Tank Bottom Sludge (Contaminated Soil, Sand, Rust Particles, etc.) (Kilograms/Pounds)	Bulk Distribution Plants (Petroleum Products)	2,700	6,000	1,360	3,000	2,270	5,000
Tetraethyl Lead Sludge (Kilograms/Pounds)	Bulk Distribution Plants (Petroleum Products)	270	600	136	300	227	500
Waste Oil (Liters/Gallons)	Motor Vehicles Power Generating Facilities Hilo Airport Facility Bulk Distribution Plants (Petroleum Products) Industrial Equipment	1,194,000	314,100	554,000	145,700	885,000	232,900

TASK 2 STORAGE

The location, type, and quantity of hazardous waste retained from previous years are identified below.

2A Vector Control Branch of State Department of Health

The local vector control offices are currently storing the following suspended or unusable pesticides:

2A.1 Oahu

- 45 kilograms (100 pounds) of ANTU powder
- 104 kilograms (228 pounds) of Cyanogas
- 8 liters (two gallons) of Red Squill
- 144 kilograms (316 pounds) of Zinc Phosphide
- 11 kilograms (25 pounds) of Sodium Fluoroacetate
- 11 kilograms (25 pounds) of Warfarin
- 1,818 kilograms (4,000 pounds) of DDT

2A.2 Hawaii

- 6,700 kilograms (14,750 pounds) of DDT
- 345 kilograms (760 pounds) of Zinc Phosphide

2A.3 Kauai

- 2.7 kilograms (six pounds) of Cyanogas
- 3.8 liters (one gallon) of Pyrellin E.C.
- 11.4 liters (three gallons) of Pyrenone
- 152 liters (40 gallons) of DDT

2A.4 Maui

- 46 kilograms (100 pounds) of DDT

2B State Department of Civil Defense

The Civil Defense Department is storing the following suspended and unusable pesticides within the vaults and tunnels on Diamond Head:

- 16,364 kilograms (36,000 pounds) of DDT
- 190 liters (50 gallons) of Dieldrin
- 2,280 liters (600 gallons) of Paris Green

2C Wood Preserving Industry

The Honolulu Wood Treating Company, Ltd. is storing approximately 30,000 liters (8,000 gallons) of sludge containing arsenic and chromium compounds in steel drums. This company is also storing 600 empty fifty-five-gallon steel drums originally holding pesticides containing arsenic and chromic acids.

2D Hawaiian Electric Company

The Hawaiian Electric Company is storing 16 to 20 substation capacitors containing PCB fluid (approximately 230 liters/600 gallons). The company is seeking a new mainland disposal point, since Monsanto closed their incineration facility.

2E University of Hawaii at Manoa

The University of Hawaii at Manoa is storing fifty kilograms (110 pounds) of assorted suspended and/or unusable pesticides, 91 kilograms (200 pounds) of halogenated hydrocarbons, and a small quantity of expired medicines.

2F Sugar Plantations

One sugar plantation reported storing 4,800 kilograms (10,550 pounds) of pentachlorophenol (a pesticide).

2G Fabric Cleaners

Some fabric cleaners are storing an undetermined amount of parafin-contaminated perchlorethylene, a cleaning solvent, in steel drums.

2H Military Installations (Reference 7)

A list of suspended and unusable pesticides held in storage at military installations on Oahu is as follows:

- 76 liters (20 gallons) of Aldrin
- 648 kilograms (1,425 pounds) of DDT
- 52 kilograms (115 pounds) of Diazinon
- 273 kilograms (600 pounds) of Dursban
- 209 kilograms (460 pounds) of Malathion
- 4.5 kilograms (10 pounds) of Paris Green
- 977 kilograms (2,150 pounds) of Miscellaneous Herbicides
- 71 kilograms (156 pounds) of Miscellaneous Rodenticides

The Air Force reported storing 1,900 liters (500 gallons) of PCB fluid.

2I Jewelry Manufacturers

Some jewelry manufacturers are storing a small amount of sodium cyanide. Sodium cyanide is used in gold stripping.

TASK 3 PROJECTIONS

Projections of hazardous waste generation in the State of Hawaii are presented in Tables 1-5 through 1-8. Methodology used in preparing these projections is described below.

3A Wastewater Treatment Sludges

Future digested sewage sludge quantities were projected by the Public Works Department of each Hawaiian county. No future increases in wastewater treatment sludges from the Waipahu incinerator are projected because it is presently operating at maximum capacity.

3B Industrial/Commercial Wastes

Projections for acids, alkalies, inorganic chemicals photo chemicals, dye/ink wastes, used solvents, petroleum wastes, contaminated soils, and sludges generated by industrial/commercial enterprises are based on information obtained from individual interviews.

3C Military Installations

Interviews with military personnel revealed quantities reported in the Armed Services Report (Reference 7) are representative of expected future generation, barring unforeseen occurrences such as war or major facility closure.

3D Pathological Wastes/Expired Medicines

It is assumed generation of these wastes will parallel population growth, as follows (Reference 2):

- Oahu - two percent per year
- Hawaii - three percent per year
- Kauai - two percent per year
- Maui - three percent per year

3E Spent Pesticide Containers

Future generation of pesticide containers was estimated by analyzing past pesticide usage trends. Data for trend analysis was obtained from the annual reports on pesticide usage prepared by the University of Hawaii (Reference 11).

TABLE 1-5 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION - OAHU (SHEET 1 OF 1)

Hazardous Waste	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Acids (Liters/Gallons)	958,000	252,000	996,000	262,000	1,026,000	270,000
Acid Sludge (Liters/Gallons)	1,900	500	1,900	500	1,900	500
Alkalies (Liters/Gallons)	281,200	74,000	281,200	74,000	285,000	75,000
Biological Sludge (Liters/Gallons)	1,178,000	310,000	1,178,000	310,000	1,178,000	310,000
Catalyst (Metric/English Tons)	250	280	288	320	288	320
Chromium Wastes (Liters/Gallons)	6,800	1,800	6,800	1,800	6,800	1,800
Damaged Capacitors (Items)	16 - 20		16 - 20		16 - 20	
Digested Sludge (Cubic Meters/Yards)	645	850	875	1,150	680	890
(Metric/English Tons)			14,800	16,400	21,000	23,400
Dye/Ink Wastes (Liters/Gallons)	41,800	11,000	43,300	11,400	44,800	11,800
Expired Medicines (Kilograms/Pounds)	2,000	4,400	2,200	4,900	2,500	5,400
Heavy Metal Sludge (Cubic Meters/Yards)	2,830	3,700	2,980	3,900	2,980	3,960
Inorganic Wastes (Liters/Gallons)	3,800	1,000	3,800	1,000	3,800	1,000
(Kilograms/Pounds)	3,080	6,600	3,080	6,600	3,080	6,600
Lime Slurry (Metric/English Tons)	1,080	1,200	1,080	1,200	1,080	1,200
Oil Sludge (Liters/Gallons)	951,900	250,000	951,900	250,000	951,900	250,000
Oily Water (Liters/Gallons)	7,334,000	1,930,000	7,714,000	2,030,000	8,094,000	2,130,000
Paint Contaminated Soil and Sand (Metric/English Tons)	670	740	670	740	670	740
Pathological/Infectious Wastes (Kilograms/Pounds)	20,300	44,600	21,800	48,000	23,600	52,000
(Liters/Gallons)	28,300	7,400	30,400	8,000	33,100	8,700
Pesticide Containers (Items)	51,000		49,000		47,000	
Photo Chemicals (Liters/Gallons)	954,000	251,000	961,000	253,000	969,000	255,000
Solvents (Liters/Gallons)	745,000	196,000	760,000	200,000	775,000	204,000
Spent Clays (Metric/English Tons)	45	50	54	60	54	60
Spent Seed Treatment Solutions (Liters/Gallons)	1,900,000	500,000	1,900,000	500,000	1,900,000	500,000
Strong Oxidizers and Reducers (Kilograms/Pounds)	4,400	9,600	4,400	9,600	4,400	9,600
Tank Bottom Sediments (Metric/English Tons)	45	50	194	51	194	51
Tetraethyl Lead Sludge (Kilograms/Pounds)	4,100	9,000	4,100	9,000	4,100	9,000
Waste Oil (Liters/Gallons)	34,375,000	9,046,000	36,495,000	9,604,000	39,098,000	10,289,000

TABLE 1-6 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION - HAWAII (SHEET 1 OF 1)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Acids/Alkalies (Liters/Gallons)	2,660	700	2,700	710	2,740	720
Digested Sewage Sludge (Cubic Meters/Feet)	40	1,300	50	1,900	70	2,000
Dye/Ink Wastes (Liters/Gallons)	3,800	1,000	3,990	1,050	4,180	1,100
Expired Medicines (Kilograms/Pounds)	320	700	370	800	430	940
Heavy Metal Sludge (Cubic Meters/Yards)	150	200	206	270	206	270
Inorganic Wastes (Liters/Gallons)	190	50	194	51	198	52
(Kilograms/Pounds)	270	600	270	600	270	600
Oily Water (Liters/Gallons)	285,000	75,000	289,000	76,000	293,000	77,000
Pathological/Infectious Wastes (Kilograms/Pounds)	3,400	7,400	3,900	8,600	4,500	9,900
(Liters/Gallons)	4,900	1,300	5,700	1,500	6,600	1,700
Pesticide Containers	27,600 Items		23,000 Items		19,000 Items	
Photo Chemicals (Liters/Gallons)	3,800	1,000	4,200	1,100	4,600	1,200
Solvents (Liters/Gallons)	22,800	6,000	23,200	6,100	23,600	6,200
Spent Seed Treatment Solutions (Liters/Gallons)	1,290,000	340,000	1,290,000	340,000	1,290,000	340,000
Tank Bottom Sludge (Kilograms/Pounds)	2,700	6,000	2,800	6,100	2,800	6,100
Tetraethyl Lead Sludge (Kilograms/Pounds)	270	600	270	600	270	600
Waste Oil (Liters/Gallons)	1,200,000	314,100	1,600,000	420,000	1,900,000	500,000

TABLE 1-7 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION - KAUAI (SHEET 1 OF 1)

Waste Material	Annual Quantity 1977 Metric	1977 English	1982 Metric	1982 English	1987 Metric	1987 English
Digested Sewage Sludge (Cubic Meters/Feet)	20	800	60	2,000	115	4,000
Dye/Ink Wastes (Liters/Gallons)	1,900	500	2,000	525	2,100	550
Expired Medicines (Kilograms/Pounds)	180	400	200	440	220	490
Heavy Metal Sludge (Cubic Meters/Yards)	75	100	75	100	190	250
Inorganic Wastes (Kilograms/Pounds)	135	300	135	300	135	300
Pathological/Infectious Wastes (Kilograms/Pounds) (Liters/Gallons)	1,800 2,700	3,900 700	2,000 2,900	4,300 770	2,200 3,200	4,800 850
Pesticide Containers	6,000 Items		5,500 Items		5,200 Items	
Photo Chemicals (Liters/Gallons)	1,140	300	1,250	330	1,370	360
Spent Seed Treatment Solutions (Liters/Gallons)	114,000	30,000	114,000	30,000	114,000	30,000
Tank Bottom Sludge (Kilograms/Pounds)	1,360	3,000	1,380	3,050	1,410	3,100
Tetraethyl Lead Sludge (Kilograms/Pounds)	136	300	136	300	136	300
Waste Oil (Liters/Gallons)	554,000	145,700	646,000	170,000	741,000	195,000

TABLE 1-8 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION - MAUI (SHEET 1 OF 1)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Acids/Alkalies (Liters/Gallons)	4,560	1,200	4,660	1,225	4,750	1,250
Digested Sewage Sludge (Cubic Meters/Yards)	0.14	5	4	140	8.3	300
Dye/Ink Wastes (Liters/Gallons)	3,000	800	3,200	850	3,400	900
Expired Medicines (Kilograms/Pounds)	180	400	210	460	250	540
Heavy Metal Sludge (Cubic Meters/Yards)	115	150	115	150	115	150
Inorganic Wastes (Liters/Gallons) (Kilograms/Pounds)	150 225	40 500	156 225	41 500	160 225	42 500
Pathological/Infectious Wastes (Kilograms/Pounds) (Liters/Gallons)	2,000 3,000	4,400 800	2,300 3,500	5,100 930	2,700 4,100	5,900 1,100
Pesticide Containers	37,700 Items		29,000 Items		22,000 Items	
Photo Chemicals (Liters/Gallons)	3,400	900	3,800	1,000	4,200	1,100
Solvents (Liters/Gallons)	15,200	4,000	15,500	4,075	15,800	4,150
Spent Seed Treatment Solutions (Liters/Gallons)	2,812,000	740,000	2,812,000	740,000	2,812,000	740,000
Tank Bottom Sludge (Kilograms/Pounds)	2,270	5,000	2,310	5,075	2,340	5,150
Tetraethyl Lead Sludge (Kilograms/Pounds)	227	500	227	500	227	500
Waste Oil (Liters/Gallons)	885,000	232,900	1,140,000	300,000	1,448,000	380,000

The results of the trend analysis are as follows:

- Agricultural - four percent decrease per year.
- Industrial/commercial - two percent increase per year.
- Government - three percent increase per year.

One factor affecting generation is future acceptance of bulk tank purchases by pesticide users. These tanks, once emptied, are returned to the manufacturer for refilling.

3F Spent Sugar Cane Seed Treatment Solutions

Discussions with the Hawaiian Sugar Planters' Association revealed the quantity of pesticides used for seed treatment has remained stable for a considerable time, and this trend is expected to continue.

3G University Wastes

Knowledgeable university personnel recommended against projecting types and quantities of university wastes because generation depends on activities and research being funded, and these factors have varied sharply in the past.

3H Waste Oil

3H.1 Motor Vehicles

Future generation of motor vehicle waste oil will vary correspondent to number of vehicles registered. Vehicle registration as of 1976, and future expectations for each island, were obtained from the respective county Motor Vehicle Registration office and are as follows:

	1976 Registration	Expected Yearly Increase
Oahu	427,000	4.5%
Hawaii	56,000	6.0%
Kauai	25,000	3.0%
Maui	44,000	5.0%

3H.2 Power Generating Facilities

Additions to existing power generating facilities are planned in each county over the next ten years. This will cause a corresponding increase in the quantities of waste oil generated.

- Additions planned by the Hawaiian Electric Company will add approximately 11,400 liters (3,000 gallons) per year by 1982. No further additions are planned through 1987.
- The additions planned by Hilo Electric Company will add approximately 1,520 liters (400 gallons) per year by 1982. No further additions are planned through 1987.
- The additions planned by Maui Electric Company will add approximately 13,700 liters (3,600 gallons) per year by 1982, and an additional 18,200 liters (4,800 gallons) per year by 1987.
- The additions planned by Kauai Electric Company will add approximately 1,700 liters (450 gallons) per year by 1987.

3H.3 Airport Facilities

It is assumed waste oil generated at these facilities will increase parallel to tourist industry growth (three percent per year; Reference 12).

3I Potential New Developments

Mining of nodules collected from the ocean bottom is being considered by several firms. A report has been issued by the State Planning and Economic Development Department (Center for Science Policy and Technology Assessment) proposing that a nodule processing facility be constructed on the Island of Hawaii. Processing of this type will generate a large quantity of hazardous wastes. Types and quantities are as yet undetermined.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

4A Identified Haulers and Storage, Processing, Recovery, and Disposal Site Operators

Seven waste petroleum products haulers were identifed during field investigations:

Oahu

- Petroleum Services
- Pacific Marine
- Putska and Spain
- Grace Brothers
- Filters Pacific
- Alson Hawaii

Hawaii

- Hilo Transportation & Terminal Company, Inc.

Cesspool pumpers also collect and transport waste petroleum products. General refuse firms collect miscellaneous pesticide containers, used solvents, waste oil, and minor amounts of untreated pathological/infectious wastes with the general refuse. Some refuse collectors transport contaminated soil and sand separately. Other hazardous wastes transported are hauled by generators directly to local landfills and the County incinerator at Waipahu.

Energy Recovery Systems (ERS), a subsidiary of Pacific Marine & Supply Company, Ltd., operates the only permitted hazardous waste incinerator in the state. The incinerator is a liquid injection combustor. Primary combustion chamber size is 1.5 meters in diameter and 4.5 meters in length (five feet by 15 feet). Temperatures to 1,080°C (2,000°F) can be maintained, although the usual operating temperature is 830°C (1,550°F). Dwell time is 0.6 second. The unit does not have pollution control devices or secondary combustion chamber. Hazardous wastes ERS has permission to incinerate are shown in Table 1-9. In 1976 323,000 liters (85,000 gallons) of hazardous wastes was incinerated. Waste oils are reprocessed for fuel where feasible. Oily waters are processed for oil recovery. Waters from this process, after oil recovery, are used for road dusting or disposed to a ditch on facility property. Bottom sludge from the oil separation unit is ponded in an on-site bermed area. Approximately 20 cubic meters (27 cubic yards) is generated yearly.

TABLE 1-9

HAZARDOUS WASTES DISPOSED AT ENERGY RECOVERY SYSTEMS LIQUID WASTE INCINERATOR

Petroleum Solvents

Hexane
Heptane
Octane
Benzene
Toluene
Xylene

Paints

Lacquers*
Thinners
Shellac
Enamel*

Plastics

Styrene (Ethylbenzene)
Glycolethers
Triols

Alcohols

Alcohols
Methanol
Ethanol
Propanol
Isopropanol
Butanol
Cyclohexanol
Methyl amyl alcohol

Ketones

Acetone
Methylethylketone (MEK)
Methylisobutylketone (MIBK)
Ethers
Solvent Residues
Napthalene
Camphor

Fuels and Oils

EDTA
Fuel Residue
Vegetable Oil
Hydraulic Oil
Grease
Fuel Oil
Otto Fuel
Hydrazine

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* Only those without heavy metal additives, such as lead, arsenic, mercury, etc.

Kapaa Landfill, operated by the City and County of Honolulu, receives the bulk of sewage treatment sludge generated on Oahu. An area of this site is also set aside for waste oil and used solvent disposal. This area is a potential fire hazard. It is adjacent to a hill of vegetation and no signs are posted warning of the flammability of the wastes being disposed.

Hawaiian Independent Refinery and Hawaii Electric reported accepting waste oil for use as supplemental fuel oil. Hilo Electric and Maui Electric reported reusing their waste lubricating oil as supplemental fuel oil.

Facilities utilized by armed services for handling and disposing of hazardous wastes are as follows (Reference 7):

- Navy Industrial Waste Treatment Plant (for acids, alkalies, cyanide, and chromium wastes)
- Navy Oil Reclamation Facility (for contaminated oil with high flash point - not for solvents)
- Air Force Oil Separation Plants (for removal of emulsified and free-floating oil from wash rack effluent, and vehicle maintenance shops)
- Air Force Silver Recovery Unit (provides removal of silver from photo chemical solutions)
- Army Pathological Waste Incinerator (Schofield Barracks)
- Army - Schofield Barracks Landfill (for prestabilized hazardous wastes only)*
- Army - Waste Petroleum Products (POL) Collection Yard**
- U. S. Marine Corps Kaneohe Landfill (for prestabilized hazardous wastes only)*
- ERS (for petroleum solvents, ketones, alcohols, plastics, paints, fuels, and oils)

Although the Navy, Army, Air Force, and Marine Corps are autonomous in function, an interagency understanding exists which allows for sharing of facilities when needed, primarily on a cost-reimbursable basis.

4B Evaluation Criteria

The criteria established to delineate minimum acceptable standards of certain hazardous waste management practices appear in Appendix B. These criteria should be updated upon promulgation of PL94-580 standards and guidelines (refer to Section 5B).

* Example: Rinsed pesticide containers and autoclaved pathological wastes.

** Army Facilities Engineers utilize a portion of waste oil temporarily stored at the POL yard as a supplemental boiler fuel at base laundries. Other wastes stored are eventually hauled to ERS for disposal.

4C Investigation of Identified Operations

Field surveys of all identified non-military storage, treatment, and disposal operations in the State of Hawaii were undertaken in August and October 1977. Descriptions and evaluations of current hazardous waste management practices are presented in Section 4D. Field surveys of military operations were not conducted during this study.

4D Evaluation of Practices (Non-Military)

Evaluations of non-military hazardous waste management practices discussed below are summarized in Table 1-10.

4D.1 Acids/Alkalies

Sulfuric acid and strong alkalies generated during electroplating operations by jewelry manufacturers were reported neutralized prior to discharge, or discharged directly to the sewer system every four to six weeks. The small quantity of solutions neutralized allows sewer system discharge to be environmentally acceptable. Discharge of untreated solutions is, however, considered environmentally unacceptable. A combined total of 60,800 liters (16,000 gallons) is generated each year.

Sulfuric acid and caustic soda generated during steel galvanizing operations are disposed to a cesspool, untreated, every four to six months. This disposal practice is considered environmentally unacceptable. A combined total of 95,000 liters (25,000 gallons) is generated each year.

Sulfuric acid and sodium hydroxide solutions generated in laboratory analyses at grain mill operations are disposed, after adequate dilution, to storm drains and the sewer system. Storm drain disposal is considered environmentally unacceptable. Dilution is not a recommended practice for large quantities. A combined total of 429,400 liters (113,000 gallons) is generated each year.

4D.2 Biological Sludge

One refinery treats its process wastewater flow through aeration and the addition of lime. The biological sludge generated is removed to drying beds as required and transferred periodically to a local landfill. Disposal at local landfills is considered unacceptable.

4D.3 Catalyst and Spent Clays

The two refineries operating on Oahu generated spent catalysts and clays. The catalysts from one refinery are recycled through a number of mainland sources. Those from the second refinery are stockpiled

TABLE 1-10 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES - HAWAII 1977 (SHEET 1 OF 2)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Acids	Lined Drums (Yes)	Truck (Yes)	Neutralization (Yes)*; Dilution (No); None (No)	Sewer System (Yes)*; Storm Drain (No); Cesspool (No)
Alkalies	None	None	Neutralization (Yes);* Dilution (No)	Sewer System (Yes)*; Cesspool (No)
Biological Sludge (Refinery)	Drying Basin (Yes)	Truck (Yes)	Solar Evaporation (Yes)	Landfill (No)
Catalyst (Refinery)	Open Stockpile (No); Steel Drums (Yes)	Truck (Yes)	None	Landfill (No); Recycle (Yes)
Damaged Capacitors (Containing PCB's)	Steel Drums (Yes)	None	None	Shipped to Mainland for Disposal at EPA Approved Facility (Yes)
Digested Sewage Sludge	Drying Beds (Yes)	Truck (Yes); Pipeline (Yes)	Solar Evaporation (Yes); Vacuum Filters (Yes); Rotating Gravity Concentrators (Yes)	Landfill (Yes); Distributed for Horticultural Use (Yes)
Dye/Ink Waste	Steel Containers (Yes)	Truck (Yes)	Filtration (Yes)	Landfill (No); Reuse (Yes)
Expired and Unusable Medicines	Plastic Bags (Yes); Original Containers (Yes)	Hand (Yes); Truck (Yes)	Incineration (Yes)	Landfill (Yes)**; On-Site Burial (No); Sewer System (Yes); Returned to Manufacturer (Yes); Incineration (Yes)**
Heavy Metal Sludge				
• Wood Industry	Steel Drums (Yes)	--	None	No Plan at this Time
• Power Plant Facilities	Open Stockpile (No)	--	None	No Plan at this Time
• Waipahu Incinerator (Wastewater Treatment System)	Open Stockpile (No)	--	None	No Plan at this Time
Inorganic Compounds				
• Cyanide Waste	Open Container (No); Sealed Container (Yes)	None; Hand/Truck (Yes)	None	
• Asbestos	Airtight Container (Yes); Open Container (No)	Compactor Truck (No)	None	Landfill (Yes); Dispersed to Atmosphere (No)
Lime Slurry	Concrete Retaining Areas (Yes)	Truck (Yes)	Drying Ponds (Yes); Thickeners (Yes)	Land Spreading (Yes); Landfill (Yes); Recycle (Yes)

* Resulting salts from neutralization containing heavy metals or toxic elements require disposal at a hazardous waste disposal facility; extremely large quantities of any salt can be detrimental to the environment and so should be excluded from the sewer system and disposal at a hazardous waste disposal facility.

** Certain medicines should not be incinerated because particulate and exhaust gases are toxic.

*** Concentrations of waste(s) must not exceed sewer code.

TABLE 1-10 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES - HAWAII 1977 (SHEET 2 OF 2)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Oil Sludge	Ponding (Yes)	Truck (Yes)	Solar Evaporation (No)	Spread on Facility Grounds (No); Landfill (No)
Oily Water	Tanks (Yes)	Truck (Yes)	Oil Separation (Yes)	Road Dusting (No); Added to Process Waste Waters at Refineries (Yes)
Paint Contaminated Soil and Sand	None	Truck (Yes)	None	Landfill (No)
Pathological/Infectious Waste	Plastic/Glass/Metal Containers (Yes)	Hand/Truck (Yes)	Incineration (Yes); Sterilization (Yes); Dilution (Yes)**; Placed in Unsecured Refuse Bins (No)	Landfill (Yes); Cesspool (Yes); Sewer System (Yes); Mortuaries (Tissue Disposal) (Yes); Incineration (Yes)
Pesticide Containers	Secure Area (Yes)	Truck (Yes)	Triple-Rinsed/Punctured/Crushed (Yes); Punctured/Crushed (No)	Landfill (Yes); Burial On-Site (No)
Photo Chemicals	None	None	Silver Recovery (Yes); Dilution (Yes)	Sewer System (Yes)***
Solvents	Steel Containers (Yes)	Truck (Yes)	None	Landfill (No); Incineration (Yes)*****
Spent Clays (Refinery)	Open Stockpile (Yes)	Truck (Yes)	None	Landfill (Yes); Land Spreading On-Site (Yes)
Spent Seed Treatment Solutions	None	Truck (Yes)	None	Ponding****; Land Spreading on Unproductive Land****
Suspended and Unusable Pesticides	Locked Building (Yes); Secured Areas (Yes)	N/A	N/A	No Plans at this Time
Tank Bottom Sediments	Open Stockpile (No)	Truck (Yes)	None	Burial On-Site (No); Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (Yes)	Truck (Yes)	Weathering (No)	Land Spreading (No); Burial On-Site (No)
Waste Oil	Sumps (Yes); Steel Drums (Yes); Tanks (Yes)	Truck (Yes)	Centrifugation (Yes)	Road Dusting (No); Landfill (No); Recycling (Yes); Incineration (Yes); On-Site or Indiscriminate Dumping (No)

*Resulting salts from neutralization containing heavy metals or toxic elements require disposal at a hazardous waste disposal facility; extremely large quantities of any salt can be detrimental to the environment and thus should also be excluded from the sewer system and disposal at a hazardous waste disposal facility.

**Certain medicines should not be incinerated because particulate and exhaust gases are toxic. Practices require a case-by-case decision.

***Concentration of waste(s) must not exceed sewer code.

****Currently being evaluated by U.S. Environmental Protection Agency.

*****Refer to Table 1-4 for solvents that ERS can incinerate.

on-site and transferred to a local landfill every two or three years. The trace amounts of nickel contained in the catalysts might be leachable. Disposal at local landfills is therefore unacceptable. The refinery generating this catalyst should be encouraged to find a mainland recycler.

Spent clays (diatomaceous earth) from one refinery are spread on-site, while the second refinery stockpiles and periodically transfers these clays to a landfill. These disposal practices are acceptable.

4D.4 Damaged Capacitors (Power Generating Facilities)

Hawaiian Electric Company (HECO) stores damaged substation capacitors containing PCB's in steel drums. They have previously shipped these drums with lids welded shut to Monsanto's (unit manufacturer's) mainland disposal facility. Monsanto, as of 1977, closed their facility. HECO is in the process of locating another mainland disposal facility. The EPA, on February 17, 1978, issued regulations regarding the disposal of PCB material and its containers. Regulations limit disposal to an EPA approved facility as of April 18, 1978.

4D.5 Digested Sewage Sludge

Presently digested sewage sludge generated on Oahu is landfilled. The landfill receiving the bulk of the sludge is operated by the City and County of Honolulu and is located in Kapaa. Sludge is buried separately from other solid wastes because of codisposal operating problems experienced in the past. Sludge composition tests have shown no substantial quantity of toxic metals. Disposing at local landfills is therefore environmentally acceptable. Facilities under construction at Sand Island and Honouliuli will have multi-hearth incinerators to handle generated sludge. Sludge generated at Sand Island will be tested for marketability and safety as fertilizer after nutrient reinforcement and heat treatment.

Digested sludge from the Keauhou sewage treatment plant (County of Hawaii) is utilized at a nearby nursery. The sludge from the other two island plants is (1) being disposed on-site for purposes of soil conditioning; or (2) taken to a local landfill.

Digested sludge from Wailua and Lihue sewage treatment plants (County of Kauai) is stored in drying beds and utilized at Wailua Golf Course as soil conditioner. No sludge is produced at the Waimea plant because of low flows. Future sludge will be stored in drying beds and used as soil conditioner around treatment plant grounds. Sludge, produced at Eleele, is also stored in drying beds and used as soil conditioner around treatment plant grounds.

Digested sludge from Kihei Sewage Treatment Plant (County of Maui) is stockpiled after dewatering. Future sludge from this facility and facilities planned for Kahului and Lahaina will be composted or landfilled.

Because no industries currently discharge wastewater contaminated with heavy metals on the Outer Hawaiian Islands, present and projected disposal methods are considered environmentally acceptable.

4D.6 Dye/Ink Wastes

Most dye and ink wastes generated by printers and publishers are disposed at landfills, on facility grounds, and to the sewer system. These practices are considered environmentally unacceptable. Approximately 10 percent is being filtered on-site for reuse. This practice should be encouraged.

4D.7 Expired and Unusable Medicines

The bulk of expired and unusable medicines (over 90 percent) is returned to manufacturers or vendors for credit. The remaining 10 percent is:

- Incinerated;*
- Flushed to the sewer system;
- Buried on-site; or
- Sealed in plastic bags and disposed in general refuse bins.

The practices of burial on-site or sealing in plastic bags that go directly to refuse bins and later landfilled are unacceptable due to lack of control and potential accessibility by animals and scavengers. Separate handling and burial at sanitary landfills is acceptable. In most cases, narcotics are collected and disposed of by the Food and Drug Branch of the State Health Department. Because of the wide variety of medicines requiring destruction, proper disposal methods (by incineration, sewering, or landfilling) should be determined on a case-by-case basis.

4D.8 Heavy Metal Sludges

As mentioned in Task 2, one firm in the wood treating industry is storing 30,000 liters (8,000 gallons) of a process sludge containing arsenic in steel drums, an environmentally acceptable practice. This sludge is generated at 10,000 liters (2,700 gallons) per year. The firm has yet to formulate a plan for its disposal. However, they are in the process of modifying processes to reduce sludge production to 1,100 liters (300 gallons) per year to minimize the problem.

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* Certain medicines should not be incinerated because particulates and exhaust gases emitted are toxic.

In the last few years, electric companies have been required to pond wastewaters before discharge to navigable water. The ponding of air heater wastewater, boiler fireside wash water, and boiler chemical cleaning wastewater generates a sludge containing traces of heavy metals. Sludges removed are stockpiled on-site. Due to potential leaching of heavy metals, this practice is considered environmentally unacceptable.

Sludges generated at the City and County of Honolulu's Waipahu incinerator by treating wastewater from the ash quenching system and electrostatic precipitator are stockpiled on-site. Due to the potential leaching of heavy metals, this practice is considered environmentally unacceptable.

4D.9 Inorganic Compounds

Asbestos waste (a carcinogen) is generated during brake lining repairs and asbestos insulated pipe repairs. Larger generators appear to be abiding by the U. S. Department of Labor Occupational Safety and Health Administration's recommended procedures for storing this material in airtight, labelled, double plastic bags or impermeable containers for disposal at local landfills. Smaller generators, however, still dispose of asbestos dust to the air. Where collected in sweepings, it is disposed of in general refuse bins, uncontained. These practices are considered environmentally unacceptable.

Sodium cyanide wastes generated by jewelry manufacturers during gold stripping are diluted prior to discharge to the sewer system, landfilled, or stored on-site. Sewer codes have established limitations on cyanide disposal. These practices are considered environmentally unacceptable due to toxicity. Some conscientious manufacturers are storing cyanide waste because they know of no acceptable disposal alternative. As long as waste containers are covered and stored away from acids (commingling of acids and cyanides forms a highly toxic gas at room temperature; Reference 13). Temporary storage is considered environmentally acceptable.

Sodium cyanide wastes generated by chromium plating operations are stored in unsealed steel containers and transported to local landfills. This practice is likewise unacceptable.

4D.10 Lime Slurry

Lime slurry (calcium hydroxide) is generated during acetylene production. This waste is considered hazardous because of its corrosive properties. This sludge is given to the pineapple industry during canning season to neutralize process wastewaters. It is landfilled or spread over facility property during off season. Of approximately 1,080 metric tons (1,200 English tons) produced, an estimated 30 percent is used by pineapple canneries. Treating this sludge by solar evaporation followed by controlled land spreading in thin layers, or landfilling, is considered acceptable.

4D.11 Oil Sludge

Oil sludges from refineries are generated by ponding process wastewater flows. When the sludge reaches a prescribed depth it is removed. These sludges have been dried by solar evaporation and distributed around facility grounds. Oil sludges generated during ship repairs are landfilled. Disposal on facility grounds before biodegradation occurs is considered environmentally unacceptable. Landfill disposal is also considered environmentally unacceptable due to potential surface and ground water contamination.

4D.12 Oily Water

Oily waters are often disposed by road dusting without oil separation. The refineries accept bilge water and process it through normal wastewater treatment facilities. As discussed in the waste oil section, road dusting with oily water has the potential of contaminating the environment, and is therefore unacceptable.

4D.13 Paint-Contaminated Soil and Sand

Paint-contaminated soil and sand generated during bottom blasting operations is transported every three or four months and disposed of at local landfills. During blasting operations, paint chips are generated which contaminate the blasting sand. Paints normally used to coat ship bottoms contain oxides of calcium, cobalt, copper, lead, magnesium, tin, and/or zinc (Reference 9) to retard plant and organism growth. Paint-contaminated blasting sand from an operation in California was tested for its leaching potential by the California State Department of Health (Reference 15). Concentrations of copper, lead, and tin exceeded acceptable water quality standards. Disposing of this waste on private land or at the landfill is therefore environmentally unacceptable due to potential contamination of surface and ground water reserves.

4D.14 Pathological/Infectious Wastes

Pathological and infectious wastes include surgical specimens, laboratory wastes (bacteria cultures, urine, stool, blood, and biopsy specimens), sharps, test animals, and isolation ward wastes. A variety of methods is being utilized in the Hawaiian Islands to render such wastes harmless prior to removal from facility grounds. Treatment methods are as follows:

- Incineration
- Sterilization (autoclaving)
- Dilution
- Destruction (needle destructors)

After treatment, wastes are stored in refuse bins for collection by commercial and municipal crews for transport to local landfills, transported to mortuaries for cremation or burial, or disposed directly to the sewer system or cesspool.

Incinerators presently utilized provide adequately high temperatures and residence times to insure sterilization. Other treatment methods mentioned are all acceptable practices.

In a few cases, isolation ward wastes contained in plastic bags receive no treatment and are disposed of in refuse bins. Because of potential container rupture during collection in compactor vehicle and landfilling, and accessibility by animals and scavengers at the landfill, this practice is unacceptable.

4D.15 Photo Chemicals

Photo chemicals (spent developers, stop baths, fixers, hypos, and bleaches) generated by printers/publishers/photo developers are disposed to the sewer system. Elements of concern are silver, cyanide, and chromium. Silver is generated as silver thiosulfate complex from fixing baths and bleach fixers. Most generators reported silver recovery through electrolysis. Ferricyanide is the bleaching agent utilized in most color processes and is converted to ferrocyanide during processing. Chromium is generated in the form of dichromate compounds which are used as bleach by processors of some color and black and white reversal products (Reference 14). Sewer discharge limits have been set for these components. Where discharge exceeds the code,* the practice of disposing of photo chemicals to the sewer system is considered environmentally unacceptable.

4D.16 Spent Pesticide Containers

Roughly half the containers generated are reaching local county landfills or transfer stations. Site operators are incorporating these containers with other solid wastes received. Containers not transported to local disposal facilities are buried on the generator's property. Due to lack of control over on-site disposal practices, burial on-site is considered environmentally unacceptable.

Enforcement of recommended procedures for puncturing and crushing seems effective. However, interviews with a sample of plantation operators revealed enforcement and adherence to triple rinsing procedures was lax. Therefore, the practice of incorporating all containers with other solid wastes at local disposal facilities is unacceptable (Chapter 46, State Public Health Regulations).

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* At least one generator reported discharging a wastewater with characteristics exceeding code standards.

4D.17 Spent Sugar Cane Seed Treatment Solutions

These solutions (99 percent water, 0.9 percent cane trash, and 0.01 percent benlate) are hauled by truck quarterly and dumped on unproductive land or ponded. Benalte is categorized as a biodegradable, nonrestricted pesticide. Disposal by above method is under evaluation by the Federal Environmental Protection Agency (EPA).

4D.18 Suspended and Unusable Pesticides

Suspended and unusable pesticides are temporarily stored in locked storehouses or secured areas. This practice is considered acceptable until a disposal system is developed.

4D.19 Tank Bottom Sediments

At refineries and bulk distribution plants, petroleum tanks (refer to Section 4D.20) are cleaned every six to ten years, usually on a rotating basis. Sludges therefore are generated every one, two, or three years. These sludges, consisting of soil, sand, and rust particles contaminated with oil, are usually buried on-site, stockpiled on-site, or taken to a local landfill. Burial or stockpiling on-site is considered unacceptable due to lack of control over these practices. Landfilling is considered unacceptable because of the wastes' oil content.

4D.20 Tetraethyl Lead Sludge

Tetraethyl lead sludge is generated when leaded gasoline storage tanks are cleaned. The tanks at refineries and petroleum bulk distribution plants are cleaned every six to ten years, usually on a rotating basis. This sludge is buried or weathered (exposed to air) on-site. Evaporation of toxic organic lead compounds during weathering cannot be avoided in this essentially uncontrolled exposure. This method may result in local atmospheric organic lead pollution (Reference 13). Disposing of this waste at local landfills creates potential for ground water contamination. Therefore, neither of these practices are environmentally acceptable.

4D.21 Used Solvents

Used solvents are usually generated in small quantities and stored in steel containers prior to disposal:

- at landfills;
- on facility grounds; or
- to the sewer system.

A very small quantity reaches ERS for incineration. A few fabric cleaners are storing perchlorocthylene which cannot be handled at ERS. Incineration of nonchlorinated or nonfluorinated solvents at ERS and temporary storage of chlorinated and fluorinated types are environmentally acceptable practices.

4D.22 Waste Oil

Approximately one-half the waste oil obtained from motor vehicles is generated at service stations and garages. The remaining 50 percent is generated by "do-it-yourselfers" at their residences. Waste oil haulers estimate over 75 percent of the service stations and garages generating waste oil on Oahu are serviced for waste oil collection. Those not receiving services are usually smaller generators and/or those located in more isolated areas.

Of waste oil collected, as much as 60 percent has been recovered in the past as boiler fuel, reprocessed, or incinerated by Hawaiian Independent Refinery, Hawaiian Electric, or ERS. The remaining 40 percent was used for controlling dust on dirt roads. Hawaiian Electric currently does not accept waste oil. Waste oil not collected from service stations and garages was dumped indiscriminately on-site or disposed of at local landfills. The waste oil generated by garages on the Outer Hawaiian Islands was reported collected by cesspool pumpers for road dusting, disposed at local landfills, or dumped on-site.

The Hawaiian Electric Company (HECO) has no diesel generating units operating currently or planned. Therefore, no waste lubricating oil is generated. Sump oil drippings from steam units were reported mixed with other waste oils accepted for use as supplementary boiler fuel. Hilo Electric and Maui Electric reported reusing their waste lubricating oil as supplemental fuel for their boiler units. The waste oil generated at Kauai Electric is used to dust roads.

Waste oil generated at Honolulu International Airport facilities is stored in drums or underground tanks. It is estimated at least half the airline maintenance facilities contaminate their waste oil by storing used solvents in the same containers. Collection is contracted and disposal is via road dusting, landfilling, or recycling at Hawaiian Independent Refinery or Hawaiian Electric Company. Waste oil generated at Hilo Airport facilities is used for fire drills.

Most waste oil generated by industrial equipment is disposed with general refuse in steel containers or taken separately to local landfills. The remaining oil is used for road dusting, lubricating equipment, or dumped indiscriminately.

Spill oils collected by the Coast Guard or its contractors are typically used for road dusting or disposed at local landfills.

While road dusting with waste oil and oily wastewater is a common practice throughout the United States, it is not the optimum waste oil use. Disposal of waste oil and oily wastewater in this manner creates potential for ground and surface water contamination, primarily due to heavy metal additives contained in most lubricating oils. This practice is therefore considered environmentally unacceptable.

Waste oil dumping on-site, indiscriminately, or landfilling is considered environmentally unacceptable due to potential surface and ground water contamination. Use of small quantities of waste oil at Hilo Airport for fire drill practice is considered acceptable if this practice meets local air pollution control standards.

4E Evaluation of Practices (Military)

Evaluations of various military hazardous waste management practices reported in the 1975 Armed Services Study (Reference 7) are presented in Appendix E. Table 1-11 displays a list of hazardous wastes identified in the Armed Services Study as unmanageable locally. Exact generation rates were not available from this study, but it was reported generation is relatively small. As was mentioned in Section 1A.3, the Navy and Army have commissioned follow-up studies to be completed in 1978. Findings of these studies should be used to update information obtained from the 1975 Armed Services Study, when available.

TABLE 1-11

HAZARDOUS WASTES GENERATED AT MILITARY INSTALLATIONS IDENTIFIED AS UNMANAGEABLE LOCALLY IN THE ARMED SERVICES REPORT, 1975*

Suspended or Unusable Pesticides

Solvents:

- Trichloroethylene
- Tetrachloroethylene

Strong Oxidizing Agents:

- Ammonium Persulfate
- Calcium Hypochlorite

Inorganic Compounds:

- Ammonium Bifluoride
- Sodium Sulfide
- Sodium Metasilicate
- Sodium Bisulfate
- Mercuric Nitrate
- Hydrazine

Organic Compounds:

- Phenol
- Formaldehyde
- Diethanolamine

Electro-Clean Compound

Sand Blasting Abrasivs Containing Heavy Metal Compounds

Fluid Containing PCB's

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* Reference 7.

TASK 5 LAWS AND REGULATIONS

5A A Review of Existing Laws, Regulations, Ordinances Dealing With Hazardous Wastes

The Federal and State statutes, State regulations, and County ordinances affecting management of hazardous wastes are described briefly in following sections.

5A.1 Federal Statutes

The Federal statutes affecting management of hazardous wastes are summarized in Table 1-12 and described in Appendix C.

5A.2 State Statutes

5A.2.1 Chapter 321, Section 16, Hawaii Revised Statutes

This section establishes the authority of the Director of the State Health Department to regulate, supervise, and control sewage outfall areas, sewage or refuse systems or plants, and disposal of liquid or gaseous or solid substance into any State waters which will create a nuisance or render such waters harmful or detrimental or injurious to public health, safety, or welfare.

5A.2.2 Chapter 342, Hawaii Revised Statutes

This chapter describes provisions for abatement of air and water pollution, noise pollution, and solid waste pollution; defines hazardous wastes.

5A.2.3 Hawaii Pesticides Law

This law prohibits discarding any pesticide or pesticide container in any manner that would adversely affect the environment and authorizes the State Department of Agriculture to establish specific guidelines for pesticide disposal.

5A.3 State Regulations

5A.3.1 Pesticide Regulation

This regulation prohibits storage or disposal of pesticides in any manner that would create a hazard. It describes acceptable disposal practices for both reusable and unusable empty pesticide containers.

TABLE 1-12

FEDERAL STATUTES DEALING WITH HAZARDOUS WASTE MANAGEMENT*

Statute/ Administering Agency	Description
Resource Conservation and Recovery Act of 1976 (PL94-580)/Environmental Protection Agency	Places primary responsibility to regulate management of hazardous wastes on EPA.
Toxic Substances Control Act of 1976 (PL94-469)/EPA	Authorizes research and regulation of those substances found to be hazardous.
Section 112 of the Clean Air Act Amendments of 1970 (PL91/604)/EPA	Authorizes the setting of standards for hazardous air pollutants and controls the incineration of hazardous wastes.
Federal Water Pollution Control Act Amendments of 1972 (PL92-500)/ EPA	Authorizes control over toxic pollutants discharged into water from point sources, the removal of toxic pollutants from critical port and harbor areas, and a plan describing the process for the disposal of pollutants.
National Environmental Policy Act of 1969 (NEPA) (PL91-190)/Not Specified	Requires the preparation of an environmental impact statement for all Federal hazardous waste management activities.
The Occupational Safety and Health Act of 1970 (OSHA) (PL91-596)/ Department of Labor	Authorizes the setting of mandatory standards to protect people working with hazardous materials.
The Poison Prevention Packaging Act of 1970 (PL91-601)/Department of Health, Education, and Welfare	Authorizes the establishment of special packaging standards for hazardous household substances.
The Federal Hazardous Substances Labelling Act of 1960 (PL86-613)/ Department of Transportation (DOT)	Prohibits the transport of hazardous substances that have been misbranded or the labels have been removed.
Hazardous Materials Control Act of 1970 (PL91-458)/DOT	Authorizes an evaluation of the hazards associated with transporting hazardous materials.

* Reference 16.

TABLE 1-12

FEDERAL STATUTES DEALING WITH HAZARDOUS WASTE MANAGEMENT*

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Hazardous Materials Control Act of 1970 (PL91-458)/DOT	Authorizes an evaluation of the hazards associated with transporting hazardous materials.

* Reference 16.

TABLE 1-12 - (Continued)

Statute/ Administering Agency	Description
Transportation of Explosives Act (U. S. Code, Title 18, Chapter 39)/ DOT	Prohibits the unregulated transport of dangerous materials.
The Safety Regulation of Civil Aeronautics Act of 1958 (PL85-726)/Federal Aviation Administration of DOT	Authorizes FAA to develop air transportation standards to provide adequate safety.
The Hazardous Cargo Act (U. S. Code, Title 46, Chapter 7)/U. S. Coast Guard	Places controls on the water transport of dangerous substances.
The Food, Drug, and Cosmetic Act Animal Drug Amendments of 1968 (PL90-399)/Not Specified	Prohibits the misbranding of certain consumer items.
The Marine Protection Research and Sanctuaries Act of 1972 (PL92-532)/ EPA	Prohibits the transport for ocean dumping of many extremely hazardous wastes.
The Coastal Zone Management Act of 1972 (PL92-583)/Not Specified	Requires that coastal management agencies regulate hazardous waste disposal.
Section 212 of the Resource Recovery Act of 1970 (PL91-512)/EPA	Requests a study of the feasibility of a system of national hazardous waste disposal sites.
Safe Drinking Water Act of 1974 (PL93-523)/EPA	Authorizes regulation of underground injection of toxic wastes.
The Atomic Energy Act of 1954, as Amended (PL83-703)/NRC and Private Industry	Authorizes the management of radioactive wastes generated in fission reactions.
The Armed Forces Appropriation Authorization Acts of 1969 and 1970 (PL91-121; PL91-441)/Not Specified	Limits the use of Federal funds for disposal of chemical and biological warfare agents.
The Federal Environmental Pesticide Control Act of 1972 (PL92-516)/EPA	Requires the establishment of procedures and regulations for the disposal of pesticides.

5A.3.2 Public Health Regulations

5A.3.2.1 Chapter 37, Water Pollution

This chapter prohibits disposal of any wastes into State waters which would cause the water to become polluted except in compliance with a permit. It also defines water quality standards.

5A.3.2.2 Chapter 38, Sewage Treatment and Disposal Systems

This chapter establishes minimum standards governing the design, construction, operation, and maintenance of sewage treatment and disposal systems. The standards are designed to prevent water pollution, inhibit access to vectors of disease, and generally avoid hazards to human safety and health. It requires that sludge disposal not pollute ground or surface water and not produce nuisance conditions.

5A.3.2.3 Chapters 42 and 43, Ambient Air Quality Standards

Chapter 42 sets forth maximum permissible concentrations of identified pollutants in the ambient air. Chapter 43 describes the permit and registration system, methods of sampling, testing, and reporting, and control of open burning and incineration.

5A.3.2.4 Chapter 46, Solid Waste Management Control

Chapter 46 requires, specifies, and sets forth the following:

- Requires permits to operate any waste disposal facility.
- Requires incineration or sterilization of infectious or pathological wastes at generation sites.
- Specifies acceptable disposal practices for animal carcasses, explosives, and radioactive wastes.
- Sets forth acceptable disposal practices for toxic, caustic, volatile, and flammable chemical wastes.
- Sets forth acceptable disposal practices for pesticides and their containers.

5A.4 County Ordinances

All Hawaii counties have ordinances restricting wastes that can be disposed of to the sewers. Wastes considered unacceptable are:

- Any liquid or vapor having a temperature higher than 66°C (150°F).
- Any water or waste which contains more than 100 parts per million, by weight, of oil.
- Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid, or gas.
- Any water or wastes having pH lower than 5.5 or higher than 9.5 or having any other corrosive property capable of causing damage or hazard to structures, equipment, and personnel of the sewage treatment plant.
- Any water or wastes containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, or constitute a hazard in the receiving waters.

5B A Guideline for a Hazardous Waste Management Program (Reference 17)

As discussed in Appendix C, the Resource Conservation and Recovery Act of 1976 (PL94-580), Sections 3001 through 3010, requires the EPA to establish standards and promulgate regulations for proper management of hazardous wastes. States and territories are allowed the opportunity to develop and administer a substantially equivalent program in lieu of the Federal program. Grant money has been appropriated for two years to finance up to 75 percent of the program. At this time, it is undetermined whether financing will be continued. If the state or territory does not elect to administer a program, the Federal program will be put into effect and enforced by the appropriate regional EPA office.

There are several important advantages to local program control:

(1) The program can be tailored to meet local conditions. Current EPA draft regulations appear to be aimed at highly industrialized areas of the United States and are in part inappropriate to hazardous waste problems unique to islands in the Pacific Basin.

(2) Coordination with other state programs in air, water, and solid waste is simplified.

(3) Portions of the required program are already in existence locally. (The pesticide program, for example.) Implementing the full program will avoid duplication by a Federal agency of programs already established on a local level.

(4) Better public relations are promoted.

(5) Communications between islands in the Pacific Basin and EPA Region IX (San Francisco) are difficult and expensive. This will place a significant burden on industry, environmentalists, and others in representing their interests, receiving technical guidance, appealing decisions, etc.

(6) Compliance and enforcement procedures are direct.

Section 3006 of this law allows for the State to apply for interim authority to conduct the program. It allows the State two years to comply with all requirements for full authorization while offering immediate eligibility for grant funding. Requirements for partial authorization are as follows:

- Establishment of legislative authority to control on-site and off-site disposal of hazardous wastes.
- Identification of resources (manpower, matching funds, etc.) to conduct the program.
- Development of a permit system for storage, treatment, and disposal operations which is substantially equivalent to the Federal system.
- Establishment of surveillance and enforcement procedures.
- Development of a plan to bring all elements of the program into compliance with requirements for full authorization by October 21, 1980.

Application should be made to the administrator of EPA Region IX between July 20 and October 20, 1978.

The following is a guideline for development of a hazardous waste management program consistent with current draft (January 1978) EPA regulations promulgated under PL94-580. Table 1-13 displays existing laws and regulations anticipated to satisfy guideline requirements and suggests appropriate actions necessary to establish a program substantially equivalent to the Federal program.

5B.1 Legislative Authority to Establish Standards for Hazardous Waste Management

5B.2 Hazardous Waste Criteria

- Establishment of criteria for identification of hazardous waste (toxicity, persistence, flammability, corrosiveness, infectiousness, reactiveness, radioactivity).
- Establishment of a list of particular wastes subject to regulation.

TABLE 1-13 - RECOMMENDED LEGISLATIVE ACTION (SHEET 1 OF 2)

Program Guideline	Existing Law/Regulation/Ordinance	Recommended Action
Legislative Authority*	Chapter 321, 342 HRS/Hawaii Pesticide Law	None****
Hazardous Waste Criteria	Chapter 342 HRS/Chapter 46 PHR	Needs Expansion***
Standards Applicable to Generators		
• Record-keeping	--	***
• Labelling	--	***
• Containerization	--	***
• Information provided to transporters	--	***
• Manifest system	--	***
• Report submission	--	***
Standards Applicable to Transporters		
• Record-keeping	--	***
• Transporting Properly Labelled Wastes Only	--	***
• Manifest system	--	***
• Transporting wastes to permitted facilities	--	***
• Coordination with regulations of Department of Transportation	--	***
Standards Applicable to Owners/ Operators of Waste Treatment, Storage, and Disposal Facilities		
• Record-keeping	Chapter 46 PHR	None
• Reports	--	***
• Standards for design, operation, and construction of facilities	Chapter 46 PHR with respect to disposal facilities	**
• Location of facilities	Chapter 46 PHR with respect to disposal facilities	**
• Facility monitoring and inspection	--	***
• Contingency plans	--	***
• Training of facility personnel	--	***
• Maintenance of facilities	Chapter 46 PHR with respect to disposal facilities	**
• Ownership, continuity of operations, and financial responsibility	--	***
• Performance standards necessary to protect the environment and human health	--	***

* Required for interim authorization.

** Adopt regulations which meet EPA hazardous waste standards and requirements to be promulgated under PL94-580 for all other appropriate facilities.

*** Adopt regulations which meet EPA hazardous waste standards and requirements to be promulgated under PL94-580.

**** Verified by David Van Hoesen, Attorney, Williams, Van Hoesen, & Brigham, San Francisco, Opinion Letter forwarded to State of Hawaii, Department of Health, Pollution, Technical Review Branch.

TABLE 1-13 - RECOMMENDED LEGISLATIVE ACTION (SHEET 2 OF 2)

Program Guideline	Existing Law/Regulation/Ordinance	Recommended Action
Permits for Treatment, Storage, or Disposal of Hazardous Wastes*		
• Content of application	Chapter 46 PHR with respect to disposal facilities	**
• Issuance procedure	Chapter 46 PHR with respect to disposal facilities	**
• Time limitations to bring facility into compliance	Chapter 46 PHR with respect to disposal facilities	**
• Permit revocation procedure	Chapter 46 PHR with respect to disposal facilities	**
Preliminary Notification		
• Require notification by handlers of identified hazardous wastes	--	***
Enforcement Provisions*		
• Enforcement staff and funding	--	***
• Authority to inspect facilities, copy records, and obtain samples	Chapter 342 HRS	None
• Delineation of agency responsibility	Chapter 342 HRS/Hawaii Pesticide Law	None
Compliance Provisions*		
• Procedures for informing violators	Chapter 342 HRS	None
• Civil and criminal penalties	Chapter 342 HRS	None

* Required for interim authorization.

** Adopt regulations which meet EPA hazardous waste standards and requirements to be promulgated under PL94-580 for all other appropriate facilities.

*** Adopt regulations which meet EPA hazardous waste standards and requirements to be promulgated under PL94-580.

5B.3 Issuance of Standards Applicable to Generators of Hazardous Wastes

- Record-keeping practices which accurately identify quantity, composition, and disposition of hazardous wastes generated.
- Labelling practices for containers of hazardous waste.
- Containerization per U. S. Department of Transportation (DOT) requirements.
- Furnishing of information on general chemical composition of hazardous wastes to persons transporting, treating, storing, or disposing of wastes.
- Use of a manifest system to assure all hazardous wastes generated are designated for treatment, storage, or disposal at facilities for which permits have been obtained.
- Submission of reports to a responsible agency setting out quantities generated and disposition means.

5B.4 Issuance of Standards Applicable to Transporters of Hazardous Wastes

- Record-keeping concerning hazardous waste transported, including their source and delivery points.
- Transportation of hazardous waste only if properly labelled and containerized.
- Compliance with the manifest system.
- Transportation of hazardous waste only to permitted facilities.
- Coordination with DOT regulations.

5B.5 Issuance of Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- Record-keeping of hazardous wastes accepted and the manner in which the wastes were treated, stored, or disposed.
- Submission of reports with respect to manifest violations, accidents, operating conditions, and monitoring.
- Treatment, storage, or disposal of hazardous wastes received pursuant to approved procedures.
- Location, design, and construction of hazardous waste treatment, disposal, or storage facilities.

- Monitoring of air and ground water/leachate and regular inspection of facility operations.

- Contingency plans for effective action to minimize unanticipated damage from any treatment, storage, or disposal of any hazardous waste.

- Training of all facility personnel which is approved by the permitting agency.

- Maintenance of facility.

- Ownership, continuity of operations, and financial capability to cover possible accidents and closure costs.

- Performance necessary to protect the environment and human health.

- Landfills must be underlined with four feet of soil having a minimum permeability of 10^{-8} centimeters per second or be constructed with an equivalent mechanically designed system (use of impervious liners) with leachate collection.

- Incinerators must achieve 99 percent combustion efficiency and operate above 1,000°C (1,832°F) for two seconds, or equivalent.

5B.6 Permits for Treatment, Storage, or Disposal of Hazardous Waste

- Require each owner or operator to submit specified information in the permit application to ensure that permitting agency can make the most efficient and expedient determination possible.

- Mandate time limits for the application submission and review process within which both the permitting agency and the applicant or permittee must act.

- Require a compliance schedule to bring existing facilities into compliance with the act.

- Establish revocation procedures and circumstances.

5B.7 Preliminary Notification

- Require notification by hazardous waste handler within 90 days of promulgations of regulations.

5B.8 Enforcement Provisions

- Establishment of enforcement staff and adequate budget allocations to carry out program.

- Establishment of authority to inspect facilities, copy records, and obtain samples.

- Delineation of agency responsibilities.

5B.9 Compliance Provisions

- Establishment of procedures for informing violators.

- Establishment of civil and criminal penalties for noncompliance.

TASK 6 RECOMMENDED STRATEGY

6A Alternatives to Environmentally Unacceptable Practices

Alternatives for handling and disposal of wastes identified in Task 4D as presently managed in an environmentally unacceptable manner are presented in Table 1-14. Alternatives for such military wastes reported in Table 1-6 are presented in Table 1-15.

6B Evaluation of Alternatives

Alternatives presented in Table 1-14 are evaluated in the following sections. Due to lack of information on generation rates, physical forms, and current management practices for military wastes reported in Table 1-15, alternatives have not been evaluated.

6B.1 Acids/Alkalies

All acids and alkalies should be neutralized before disposal. If effluent does not contain heavy metals or other noxious materials, it may be discharged to the sewer system. Otherwise, effluents should be evaporated with sludges disposed of in a hazardous waste landfill. If adequate neutralization cannot be achieved at the generation point, solutions might be transported to the Navy's Industrial Waste Treatment Plant for treatment and disposal, or other approved facilities that are developed.

6B.2 Asbestos

Asbestos wastes now stored in open containers or disposed to the air should be collected with industrial vacuums, stored in airtight, labelled, double plastic bags or impermeable containers, and transported to a local landfill by the generator (Reference 18). The landfill operator must not puncture the container during burial. Asbestos, once buried, will not leach into ground water if soil is calcareous (basic soil) (Reference 19).

6B.3 Cyanide Waste

Sodium cyanide waste can be treated by oxidation at the Navy's Industrial Waste Treatment Plant. The alternative is on-site pretreatment with sludge disposal at a hazardous waste landfill. Storage prior to treatment or disposal should be in covered containers preventing accidental mixing with acids. Commingling of acids and cyanides forms highly toxic gas at room temperature (Reference 13).

Transportation and disposal costs in California are presented in Appendix D.

TABLE 1-14 - ALTERNATIVES TO HAWAII'S PRESENT ENVIRONMENTALLY UNACCEPTABLE PRACTICES (NON-MILITARY WASTES) (SHEET 1 OF 2)

Hazardous Waste	Storage	Transport	Recovery/ Reuse	Treatment	Disposal Point
Acids/Aklalies	--	--	By-Product Markets	Neutralization	Navy Industrial Waste Treatment Plant; Effluents to sewer system or evaporated; Heavy Metal And Noxious Sludge To Hazardous Waste Landfill; Other Sludges to Sanitary Landfill
Asbestos	Airtight Containers	Non-Compactor Truck	—	--	Sanitary Landfill with separate Burial
Cyanide Waste	Containers with Lids	DOT Regulations	--	Oxidation/pH Adjustment	Navy Industrial Waste Treatment Plant, Sludge to Hazardous Waste Landfill
Dye/Ink Wastes	--	--	Reuse	Filtration, Incineration with air emission controls	On-Site Reuse, Modified ERS Facility
Expired and Unusable Medicines	--	--	--	Incineration	Incineration Facility, Sewer System, Landfill (case-by-case decision)
Lime Slurry	--	--	Recovery; Land Spreading on Acid Soils	Solar Evaporation	Landfill; Land Spreading
Oil Sludge/Tank Bottom Sediments	On-Site**	--	Oil Recovery (Retort Distillation Facility)	Biodegradation (Landfarm)	Petroleum Waste Land Farm, Hazardous Waste Disposal Facility
Oily Water	--	--	Oil Recovery	Oil Separation, Solar Evaporation, Biodegradation	Petroleum Waste Land Farm

* Approval is required from Hawaii State Department of Agriculture, Division of Plant Industry.

** Waste will require on-site storage in accordance with EPA guidelines until adequate facilities are constructed or shipment is made.

TABLE 1-14 - ALTERNATIVES TO HAWAII'S PRESENT ENVIRONMENTALLY UNACCEPTABLE PRACTICES (NON-MILITARY WASTES) (SHEET 2 OF 2)

Hazardous Waste	Storage	Transport	Recovery/ Reuse	Treatment	Disposal Point
Pathological/Infectious Wastes	Double Bagged	Non-Compactor Truck for Isolation Ward Wastes if Not Sterilized at Generation Point	--	Sterilization, Destruction, Dilution	Hospital Incinerator, Sewer System, Landfill (Separate burial for non-treated isolation ward wastes)
Pesticide Containers	--	--	Reuse for original purpose*** Remelt Market for Approved Containers*	Triple-Rinsed, Punctured, Crushed	Sanitary Landfill
Photo Chemicals	Holding Tank (for Bulk Dumping)	--	Silver Recovery	Regeneration, Precipitation	Precipitate to Hazardous Waste Landfill
Solvents	--	--	Reuse/reclaim	Distillation, Incineration	Reclamation Facility, Modified ERS Facility
Suspended and Unusable Pesticides	Tightly Closed Containers in Cool, Dry, Secured Area, With Adequate Ventilation	Steel Drum or DOT Regulations (if Applicable)	Remanufacture	Incineration,**** Biodegradation	Modified ERS Facility, Hazardous Waste Landfill, Soil Application, Foreign Market
Tetraethyl Lead Sludge, Refinery Catalyst, Paint-Contaminated Soil and Sand, Wood Treatment Sludge, Boiler Scaling Sludge, Incinerator Waste-water treatment Sludge	On-Site**	Steel Drums or DOT Regulations (if Applicable)	Catalyst-Recovery if Feasible; Contaminated Blasting - Reuse	--	Hazardous Waste Landfill
Waste Oil	--	--	Reclaim/Recycle	Reprocessing, Incineration	Supplemental Fuel Oil Markets, ERS, Petroleum Waste Land Farm

* Approval is required from Hawaii State Department of Agriculture, Division of Plant Industry.

** Waste will require on-site storage in accordance with EPA guidelines until adequate facilities are constructed or shipment is made.

*** Requires reuse with same manufacturer and pesticide.

**** Arsenic compounds should not be incinerated (Reference 13).

TABLE 1-15 - ALTERNATIVES TO PRESENT ENVIRONMENTALLY UNACCEPTABLE PRACTICES (MILITARY WASTES) (SHEET 1 OF 1)

Hazardous Waste	Storage	Transport	Recovery/ Reuse	Treatment	Disposal Point
Inorganic Compounds					
• Ammonium Bifluoride	Tightly Closed Container Other than Glass in Cool, Dry Area	--	Possible Recovery of Calcium Fluoride (CaF_2) and Ammonium	Reaction With Excess Lime	Hazardous Waste Landfill for CaF_2 if Not Recycled
• Sodium Sulfide	Same (With Adequate Ventilation)	--	--	Hydrolysis (Residue Should be Neutralized)	Residue to Sewer System
• Sodium Metasilicate	Non-Aluminum Container	--	--	Acidification (Effluent Neutralized)	Effluent to Sewer System, Sludge (Silicate Gel) to Sanitary Landfill
• Sodium Bisulfate	--	--	--	Neutralization	Navy Industrial Waste Treatment Plant
• Mercuric Nitrate	Tightly Closed Containers	DOT Class B Poison Regulations	--	--	Hazardous Waste Landfill
• Hydrazine	--	DOT Regulations	--	Incineration	ERA with air emission control
Miscellaneous					
• Electro-Clean Compound	On-Site	--	--	--	Hazardous Waste Landfill
• Sand Blasting Abrasives Containing Heavy Metal Compounds	On-Site	--	Recycle for Reuse	Filtration	Hazardous Waste Landfill
Organic Compounds					
• Phenol	Cool, Dry, Well Ventilated Area	--	--	--	ERS with air emission control
• Formaldehyde l	Same	DOT Regulations	--	--	Activated Sludge STP
• Dethanolamine	Same	DOT Regulations	--	--	Activated Sludge STP
Solvents	--	--	Reuse	Distillation, Incineration	Reclamation Facility, Modified ERS Facility
Strong Oxidizing Agents, Ammonium Persulfate, Calcium Hypochlorite	Steel Drums, Cool Area Away from Reducing Agents	DOT Regulations	--	Reduction Using Sodium Thiosulfate, Incineration (Dilute Solution)	Reduction Facility, Effluent Sewered, Modified ERS Facility
Suspended and Unusable Pesticides	Same as Oahu	Steel Drum or DOT Regulations (if Applicable)	Remanufacture	Incineration	Modified ERS Facility, Hazardous Waste Landfill, Soil Application Site, Foreign Market

6B.4 Dye/Ink Wastes

As mentioned in Section 4D.6, approximately 10 percent of dye and ink wastes is filtered on-site, then added to new supplies for reuse. The State should encourage this practice. Incineration at a modified ERS facility (refer to Section 6B.12) should be required for dye and ink wastes not reused.

6B.5 Expired and Unusable Medicines

Expired and unusable medicines not returned to vendor or manufacturer should be incinerated, sewered, or separately buried at a local sanitary landfill. Proper disposal requires case-by-case analysis.

6B.6 Lime Slurry

The State should encourage lime slurry recovery. To avoid localized leaching from disposal of lime slurry, ponding or spreading in thin layers should be practiced, allowing water evaporation before disposal.

6B.7 Oil Sludges/Tank Bottom Sediments

These petroleum sludges,* as well as other waste petroleum products, do not require disposal at hazardous waste facilities. However, existing landfills do not provide sufficient protection against ground water contamination. Instead, sludges and other petroleum wastes should be disposed of at a land farm of proper design and operation or treated at a retort distillation facility for oil recovery.

At land farms, biodegradable sludges, liquids, and slurries are plowed or disced into the soil. The water content of the waste evaporates or percolates into the ground. Discharge sites are rotated to allow for adequate biodegradation and evaporation (Reference 21).

A land farm would not require daily operation. Active periods would depend on wastes received and frequency of generation. Development in conjunction with a hazardous waste landfill would avail economic advantages through pooling of equipment and manpower.

6B.8 Oily Water

Oily waters can be processed for oil reclamation. Where feasible, this should be encouraged. Reclaimed oils not suitable for recycling can be incinerated at ERS or disposed at a petroleum waste land farm. Road dusting with oily water should be prohibited. Effluent from oil separation units can be evaporated by ponding. If sufficient treatment occurs, effluent may be discharged to sewers, the land, or receiving waters.

* Excludes tetraethyl lead sludge discussed in Section 6B.15.

6B.9 Pathological and Infectious Wastes

Recommended procedures for handling pathological and infectious wastes are:

- Laboratory waste which cannot physically be discharged to the sewer system must be autoclaved or incinerated.
- Sharps must be destroyed to render them useless and/or disposed of in rigid containers, sealed to be impervious to spontaneous loss of contents or puncture.
- Isolation ward wastes should be autoclaved prior to disposal or incinerated. Otherwise, separate transport by the generator to the landfill and separate disposal by landfill operator is required.
- Surgical specimens and remains of test animals should be incinerated.

6B.10 Photo Chemicals

Generators of photo chemicals should be required to monitor effluent for silver, cyanide, and chromium. When sewer code limits for these components are exceeded, generators should be required to pretreat their wastes. Silver can be recovered by electrolysis. Dichromate compounds can be removed by precipitation. The precipitate (chromium hydroxide) will require disposal at a hazardous waste landfill. Regeneration techniques allow 80 percent of ferricyanide bleaches to be reused (Reference 14).

Large scale processors operate on a continuously replenishing rather than batch system. Bulk dumping may be necessary due to emergencies, periodic shutdowns, contamination, or exhaustion of solutions. Holding tanks should be utilized to permit bleeding of solutions into the waste stream. This will reduce the possibility of waste reaching the sewer system at a greater concentration than is permitted.

6B.11 Pesticide Containers

Steel drums which contained organic or metallo-organic pesticides, except those containing heavy metals, might be available for local or foreign steel remelt markets. This use must be approved by the head of the Division of Plant Industry, State Department of Agriculture. Drum recycling, if approved, should be encouraged by the State. Reuse by the original manufacturer for refilling should also be encouraged.

All other containers must be triple-rinsed, punctured, and crushed (Chapter 46, Public Health Regulations). To limit pesticide container disposal sites and control disposal operation and location, disposal should be limited to sanitary landfills.

6B.12 Solvents

Used solvents can be reclaimed through simple distillation (Reference 20). Reclamation facilities do not exist in Hawaii, although some do operate in California. Typically, these facilities accept used solvents free of charge, reprocess them, and sell the reclaimed solvents back to the generator. Reclaimed solvent costs less than the combined cost of new solvent and disposal at a hazardous waste landfill. Some facilities process as little as 7,600 to 15,200 liters (2,000 to 4,000 gallons) per month.

A simple distillation unit* to handle solvent types and quantities generated in Hawaii costs approximately $15,000 to $20,000. Reconditioned equipment is available and, if utilized, would reduce this cost. Energy Recovery Systems is a possible owner/operator. ERS has researched solvent reclamation and, depending on reuse markets and State enforcement practices, might install a packaged unit. Reclamation should be encouraged by the State.

The sludge produced from a distillation unit could be incinerated at a modified ERS facility (discussed below).

Alternatives to State reclamation are disposal via incineration or shipment to California for reclamation. As reported in Task 4A, ERS is incinerating nonchlorinated, nonfluorinated, flammable solvents. In order to incinerate all types, ERS facilities would require modifications, including an afterburner (approximately $15,000 to $20,000) and a venturi liquid scrubber (approximately $60,000).

6B.13 Suspended and Unusable Pesticides

One process recommended for treating most pesticide concentrates held in storage (chlorinated hydrocarbon compounds) is incineration (Reference 13). Pesticide incineration research has determined temperatures at or near 968°C (1,800°F) sufficiently degrade 99 percent of most pesticides. A liquid combustor followed by secondary combustion and scrubbing would probably be an acceptable disposal method. Primary combustion should occur at 801°C (1,500°F) for at least 0.5 second with secondary combustion at 1,190°C (2,200°F) minimum for at least 1.0 second.

ERS's incinerator meets temperature and dwell time requirements for primary combustion, but would require an afterburner and scrubber to meet remaining requirements. These modifications would cost approximately $15,000 and $60,000, respectively.

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* Kettle still, steam generator, condenser, vacuum filter, and cooling package.

Alternatives to incineration are:

- Hazardous waste landfill located in Oahu (if one can be sited) or California.
- Shipment back to vendor for remanufacturing.
- Soil application.

No hazardous waste landfills exist on Oahu. Representative costs for developing a site are discussed in Section 6B.15.

Shipment to a California Class I landfill has been used for disposing of hazardous wastes generated in the Pacific Basin. Costs for transportation to and disposal in California are presented in Appendix D. Anticipated EPA guidelines for hazardous waste transportation require containerization accordant with Department of Transportation (DOT) regulations (49 CFR100-189) or the National Motor Freight Classification regulations when DOT stipulations do not apply.

Some pesticides lend themselves to remanufacturing. In cases where this is an alternative, returned shipment to a manufacturer should be encouraged.

Applying biodegradable pesticides to the soil has been researched. Table 1-16 evaluates this practice for selected pesticides (Reference 22). Malathion and carbaryl, now stored by the military, are suited to this practice.

6B.14 Waste Oil

Waste oil is reclaimable and recovery should be given highest priority. Methods include rerefinement as a lubrication product and reprocessing as a fuel supplement. Waste oil is not rerefined in Hawaii, but has been reprocessed/recycled as supplemental fuel oil at Hawaiian Independent Refinery, Hawaiian Electric, Hilo Electric, Maui Electric, and ERS. These facilities have capacity to reclaim all waste oil generated. The electric companies, which currently do not accept waste oil from non-company sources, should be encouraged to do so.

As mentioned in Section 4D.22, approximately 50 percent of the waste oil generated is produced by the "do-it-yourselfer" at private residences. The State should consider enacting legislation that would educate and encourage the public to recycle their waste oil. Such legislation has been enacted in California (Senate Bill 68, "Used Oil Recycling Act") which requires enterprises selling more than 500 gallons of lubricating oil annually in containers for use off premises to provide or contract for collection facilities. The collection facilities are to be available to persons possessing not more than five gallons at one time and at no cost to the patron.

TABLE 1-16

FEASIBILITY OF SOIL DISPOSAL FOR SUSPENDED AND/OR UNUSABLE PESTICIDES*

	Soil Disposal		Soil Disposal
Herbicides		**Insecticides**	
• Atrazine	No	• Aldrin	No
• Bromacil	?	• Chlordane	No
• CDAA	?	• Chlordecone (Kepone)	No
• Chloroamben	Yes	• DDT	No
• 2,4-D	Yes	• Dieldrin	No
• Dicamba	?	• Endosulfan	No
• Diquat	No	• Endrin	No
• Diuron	No	• Heptachlor	No
• EPTC	Yes	• Methoxychlor	Yes
• Linuron	No	• Mirex	No
• Monolinuron	No	• Toxaphene	No
• Monuron	No	• Azinphosmethyl	?
• Nitralin	Yes	• Diazinon	?
• Paraquat	No	• Disulfoton	?
• Picloram	No	• Malathion	Yes
• 2,4,5-T	?	• Methyl Parathion	?
• Trifluralin	Yes	• Parathion	?
		• Phorate	?
Miscellaneous		• Carbaryl	Yes
		• Metalkamate (Bux)	Yes
• Captan	Yes		
• Dicofol	No		
• Dodine	?		
• Maneb	?		
• Methyl Bromide	No		
• Nabam	?		
• Pentachlorophenol	No		
• Zineb	?		

* Reference 22.

Dusting roads with waste oil does not constitute reclamation nor enhance environmental quality. It should be prohibited.

Waste oils containing solvents should go to ERS for incineration or a petroleum waste land farm for disposal (refer to oil sludge, Section 6B.7). If a land farm is not developed and ERS cannot incinerate the contaminated waste oil, generators should be required to keep their waste streams separate to facilitate recovery and disposal.

6B.15 Wastes Which Cannot be Properly Managed in Hawaii

Development of a hazardous waste landfill in Hawaii would be necessary to adequately handle the following wastes:

- Tetraethyl lead sludge
- Refinery catalyst
- Paint-contaminated soil and sand
- Wood treatment sludge
- Mercuric nitrate
- Boiler scaling sludge
- Incinerator wastewater treatment sludge
- Fluids containing PCB's
- Any other extremely hazardous waste

Storage and subsequent shipment to a Class I California landfill is the alternative. Transportation and disposal costs are delineated in Appendix D. On-site storage should conform to anticipated EPA regulations.

The quantity of blasting sand generated can be reduced by employment of high quality sands (e.g., copper slag types). Such sands can be recycled up to three times and cover three times the square footage per pound of sand, thus permitting a nine-fold reduction in usage. The higher quality sands are three times as expensive as lesser quality types and recycling requires an investment of $20,000 in equipment.

6C Identification of Potential Sites for Hazardous Waste Disposal

6C.1 Potential Sites

To identify potential hazardous waste disposal sites on Oahu,* Harding-Lawson Associates conducted a preliminary geological investigation based on the following criteria:

- Relative flatness of terrain
- Cover material availability
- Minimal potential for contamination of ground waters and streams

Areas showing potential are depicted in Figure 1. These areas were further evaluated according to criteria established in Appendix B. Additionally, petroleum waste land farming potential and ability to fulfill proposed Federal standards for hazardous waste disposal were examined. Table 1-17 summarizes this evaluation.

6C.2 Evaluation of Sites

Any hazardous waste site must meet Section 3004 regulations being developed by EPA under PL94-580. It is undetermined at this time whether the geological and hydrogeological conditions at any of the potential sites would meet regulations to be promulgated. If not, some type of artificial liner would have to be installed. Approximate costs of installing artificial liners are as follows (Reference 23):

Liner Type	Cost/Acre (1973)
Clay (18 inch)	$1,185
Asphalt	$6,000-$12,000
Rubber	$11,000-$22,000
Hypalon	$11,000-$22,000
Polyvinyl Chloride (PVC)	$4,840-$9,680

Development costs will depend on site-specific conditions.

Of areas available on Oahu, Barbers Point and Maili are considered best suited for a hazardous waste disposal site or petroleum waste land farm. Both have low rainfall, relatively flat terrain, adequate highway access, and have sections underlain by unpotable ground water reservoirs.

Site plans for the Barbers Point and Maili areas are presented in Figures 2 and 3. Within each area, some locations are more desirable than others due to quality of underlying ground water, type of soil, and planned land use. Desirable characteristics include:

---

* The quantity of wastes generated on the other three island counties does not warrant siting a hazardous waste landfill. However, with development of a nodule processing facility on the Island of Hawaii, quantities of tailing wastes generated would require siting a hazardous waste disposal facility.

TABLE 1-17 - EVALUATION OF POTENTIAL AREAS FOR HAZARDOUS WASTE DISPOSAL SITES (SHEET 1 OF 1)

(Groundwater assumed potable unless otherwise noted.)

Potential Disposal Sites (See Figure 1)	Average Annual Rainfall*	Ground Water Head and Quality*	Topography	Soil Types**	Land Use	Population Density (1976)***
1 - Barbers Point	20 Inches	Brackish	Flat	Coral Along Shore, Silt Toward Mountains	Military, Sugar Cane, Industrial, Housing	1.65 Person/Acre
2 - Maili	20-30 Inches	Brackish	Slopes to 35%	Coral Along Shore, Silt Toward Mountains	Military, Open Land, Housing	0.70 Person/Acre
3 - Mokuleia	30 Inches	9-17 Feet	Slopes to 30%	Silt	Sugar Cane, Open Land	0.30 Person/Acre
4 - Kahuku	40 Inches	Brackish 9 Feet	Flat	Coral Along Shore, Silt Toward Mountains	Farming, Open Land, Recreation	0.20 Person/Acre
5 - Waimanalo	46-50 Inches	Close to Water Supply	Flat	Coral Along Shore, Silt Toward Mountains	Open Land, Recreation, Housing	1.10 Person/Acre

* Oahu Hydrology by Board of Water Supply.

** Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, by Soil Conservation Service.

*** 1977 Hawaii State Data Book by Department of Planning and Economic Development.

- Underlying brackish ground water

- Low permeability cap rock overlaying any usable ground water supplies

- Underlying silt soil types

- Planned industrial use

The quality of underlying ground water is the overriding concern. Consideration should be given to potential future use, since brackish water aquifies as a potable water source after desalination. Further study is needed to select and evaluate specific sites within these areas suitable for hazardous waste disposal and waste petroleum land farming.

6D State Strategy

Figure 4 displays the schedule for recommended hazardous waste management strategy tasks for the State of Hawaii. Each task is discussed below.

6D.1 Encourage Waste Reduction, Separation, and Reutilization

To reduce quantities of hazardous waste requiring disposal, the State should encourage waste reduction, separation, and reutilization. Waste reduction and separation can be achieved through process modification and changes in waste storage practices. Waste reutilization can be achieved by securing markets for wastes as inputs to other processes.

The State can best encourage waste reduction, separation, and reutilization by requiring generators to bear the true costs of handling and managing hazardous waste in an environmentally acceptable manner. True costs include proper storage, transport, treatment, and disposal, as well as costs associated with State administration and enforcement of a hazardous waste program. Generators required to internalize these costs will seek means to reduce, separate, and find utilization markets for their hazardous waste streams to reduce their costs. State costs can be recovered by levying a surcharge on wastes treated and disposed. The States of California and Nevada are using such surcharges to generate income for their programs. Revenue from surcharges currently supports two-thirds of the State of California's cost of administering their program. Future expectations are surcharges will fund the total program.

The State should assist generators seeking markets for their hazardous wastes. Technical assistance could come from EPA. State staffing is insufficient to provide this assistance, so future hazardous waste program staffing requests should reflect this need.

The Energy Office of the State Department of Planning and Economic Development is investigating alternatives for waste oil recovery. The State Health Department should coordinate with this office and encourage investigating the feasibility of reuse at local power plants or transporting waste oil from the outer Hawaiian Islands to Oahu for recovery. In addition, the State should consider enacting legislation that would educate and encourage the public to recycle waste oil.

6D.2 Develop Cooperative Concepts

Limited treatment and disposal facilities within the Pacific Basin dictate a need for cooperative agreements enabling free flow of wastes to existing facilities. Specifically, an interagency agreement is needed between the State and military in Hawaii to share treatment and disposal facilities. In addition, if Oahu sites a hazardous waste landfill, and/or ERS facilities are modified to handle greater waste varieties, the State could coordinate with other Pacific Basin governments to assist in proper waste disposal in Hawaii. However, due to the configuration of shipping lines throughout the Pacific Basin, it is generally less expensive for the other governments to ship directly to California.

6D.3 Investigate the Siting of Hazardous Waste Transfer Stations, Landfills, and a Petroleum Waste Land Farm

Hazardous waste quantities warrant consideration of siting a hazardous waste landfill. The investigation should include:

- Selection of one or more potential sites within recommended areas (refer to Section 6C).
- Investigation of site-specific geologic and hydrologic conditions.
- Development of preliminary design and estimation of site development and operating costs.
- Determination of public or private ownership/operation and identification of potential operators.

In addition, the development of specialized transfer stations should be investigated in locations where hazardous waste quantities are small and generated intermittently (as in the case of small industries and commercial enterprises and households). These stations do not require the extensive scope of investigations and considerations of a hazardous waste landfill.

The cost to the State for contracting this study is estimated to be $40,000 to $50,000. If siting a landfill and transfer station(s) is found feasible, the State should proceed with land acquisition and facilities implementation.

6D.4 Encourage Energy Recovery Systems to Develop its Facility to Full Potential

The State should encourage ERS to make modifications (afterburner, scrubber, solvent distillation unit) discussed in previous sections. The facility could then dispose of chlorinated and fluorinated hydrocarbon wastes, stored pesticides, and reclaim used solvents. Strict enforcement of standards and guidelines would result in improved economies by augmenting waste quantities to be processed. This capability, in conjunction with implementing a hazardous waste landfill and access to Navy facilities, greatly enhances Hawaii's waste management abilities.

6D.5 Collection and Disposal of Suspended and Unusable Pesticides Held in Government Storage

If modifications are not made at ERS, and if a hazardous waste landfill cannot be sited in the near future, the State should collect all government stored pesticides for shipment and disposal in California. Continued storage of pesticides is regarded as a significant potential hazard.

The estimated costs to ship and dispose of excess government stocks are as follows:

- Vector Control - $ 1,300
- Military 400

If the Civil Defense Agency decides not to keep their supply in storage, the estimated cost to ship and dispose is $2,200.

6D.6 Submit Request for Fiscal Year 1979 Funding

Any request to EPA for Fiscal Year 1979 funding must be included in the June 1978 work plan submittal. The work plan is the Fiscal Year 1979 activities plan.

6D.7 Administration of Hazardous Waste Management Program

If the State determines it is in their best interest to administer the hazardous waste program mandated under Section 3006 of PL94-580, the following tasks must be undertaken.

6D.7.1 Prepare to Apply for Interim Authority to Administer State Program

The following steps must be completed before application for interim authority to administer the State hazardous waste program can be submitted:

- Enactment of legislation providing authority to control on-site and off-site disposal (HRS342 should suffice).

- Identification of adequate resources (funding, manpower, etc.) to implement interim program.
- Development of a permit system for storage, treatment, and disposal operations.
- Development of a surveillance plan and designation of a surveillance agency.
- Development of an authorization implementation plan to bring interim program up to standards of fully authorized program by October 20, 1980 (refer to Task 5 for requirements of a fully authorized plan).

6D.7.2 Apply for Interim Authority

Application for temporary authorization to carry out the hazardous waste program should be submitted to the Region IX Administrator between July 20 and October 20, 1978. By the time of application, the proposed program must be in existence.

6B.7.3 Administer Interim Hazardous Waste Management Program

If authorization is granted, Hawaii will be entitled to carry out the program in lieu of the Federal program for a twenty-four month period beginning October 20, 1978.

6D.7.4 Apply for Full Authority

EPA will have six months from the submission date to evaluate Hawaii's full authority application. The application therefore must be submitted by April 20, 1980 to allow sufficient time for review before interim authorization terminates.

6D.7.5 Administer Full Hazardous Waste Management Program

If authorized, administration of full program would begin October 1980.

6E Manpower Requirements

Manpower required over and above existing staff to implement the tasks proposed in Section 6D is estimated to be as follows:

Fiscal Year 1978	Manpower (Man-Years)
• Develop cooperative concepts	0.25
• Encourage waste reduction/separation/reutilization	0.10

Fiscal Year 1978 - (Continued)	Manpower (Man-Years)
• Prepare and submit Fiscal Year 1979 funding request	0.05
• Prepare and apply for interim program authority	0.30
• Encourage ERS to develop their facility to full potential	0.05
• Investigate the siting of a hazardous waste disposal facility (administration only)	0.25
Fiscal Year 1978	1.00
Fiscal Year 1979	
• Develop cooperative concepts	0.05
• Encourage waste reduction/separation/reutilization	0.25
• Prepare and submit Fiscal Year 1980 funding request	0.05
• Administer interim program	1.50
• Prepare for full authority	1.00
• Encourage ERS to develop their facility to full potential	0.05
• Investigate the siting of a hazardous waste disposal facility	0.25
• Collect and dispose of suspended and unusable pesticides held in government storage	0.05
Fiscal Year 1979	3.20
Fiscal Year 1980	
• Encourage waste reduction/separation/reutilization	0.25
• Prepare and submit Fiscal Year 1981 funding request	0.05
• Administer interim program	1.50
• Prepare and apply for full authority	1.50
Fiscal Year 1980	3.30

Fiscal Year 1981	Manpower (Man-Years)
• Encourage waste reduction/separation/reutilization	0.25
• Prepare and submit Fiscal Year 1982 funding request	0.05
• Administer full program	4.95
Fiscal Year 1981	5.25

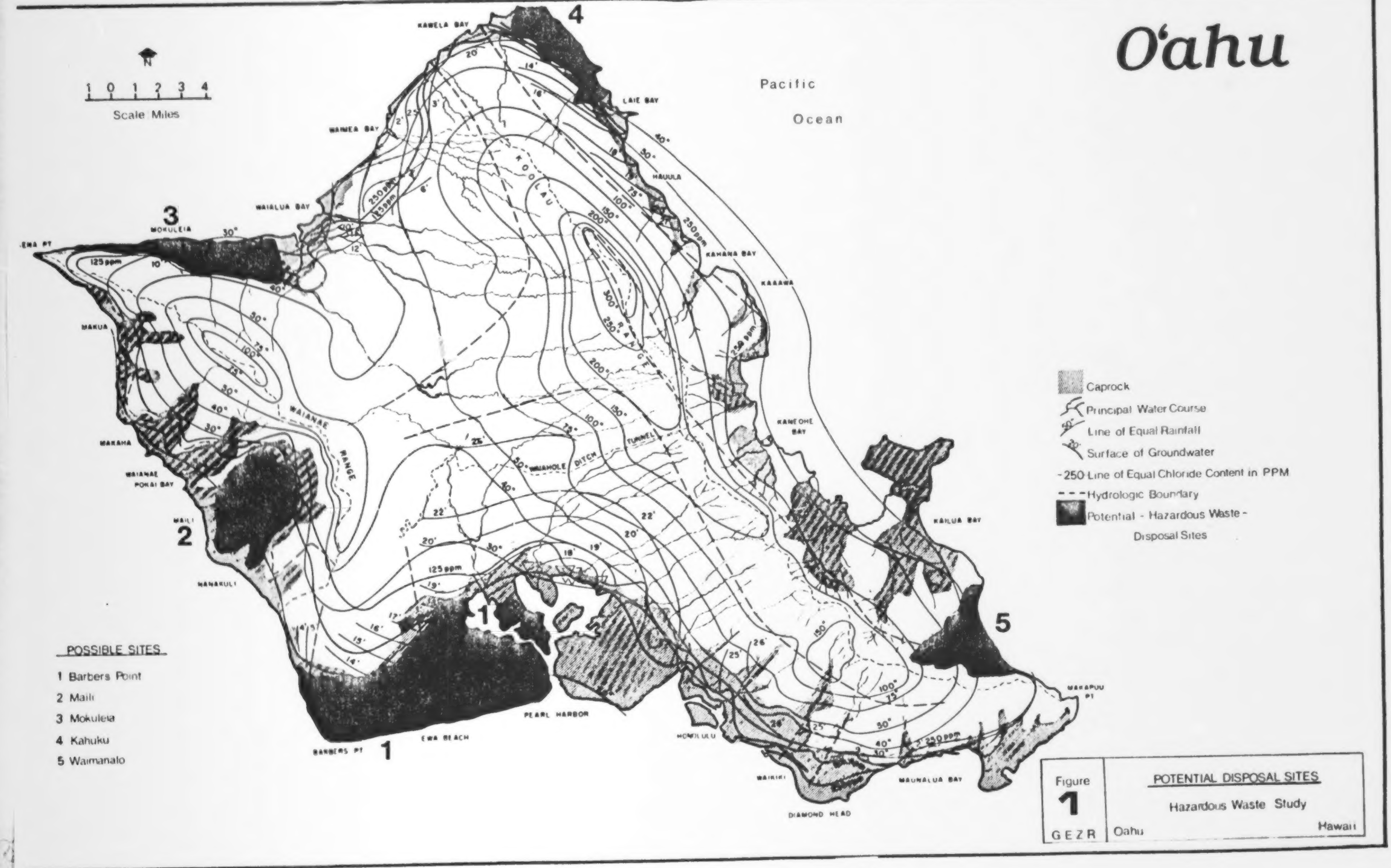
A further breakdown of 1981 manpower requirements follows:

• Administration	1.00
• Field investigations	2.00
• Manifest auditing	1.00
• Permit review	0.25
• Operations analysis	0.25
• Technical assistance/education	0.25
• Laboratory analysis	0.50
Total	5.25

6F Required Permits

Public Law 94-580, as currently interpreted by EPA, requires permits for treating, processing, disposing, and/or storing hazardous wastes. A single permit will suffice for those activities conducting multiple operations.

If the State elects to administer the hazardous waste program, approximately thirty (30) storage and seventy (70) multiple operating permits would be required.



O'ahu
Pacific
Ocean
N
1 0 1 2 3 4
Scale Miles
POSSIBLE SITES
1 Barbers Point
2 Maili
3 Mokuleia
4 Kahuku
5 Waimanalo
Caprock
Principal Water Course
Line of Equal Rainfall
Surface of Groundwater
-250 Line of Equal Chloride Content in PPM
Hydrologic Boundary
Potential - Hazardous Waste - Disposal Sites
KAWELA BAY
LAIE BAY
WAIMEA BAY
HAUULA
WAIALUA BAY
MOKULEIA
KAENA PT
KAHANA BAY
KAAAWA
MAKUA
MAKAHA
WAIANAE POKAI BAY
MAILI
NANAKULI
KOOLAU RANGE
WAIANAE RANGE
WAIAHOLE DITCH
TUNNEL
KANEOHE BAY
KAILUA BAY
PEARL HARBOR
BARBERS PT
EWA BEACH
HONOLULU
WAIKIKI
DIAMOND HEAD
MAUNALUA BAY
MAKAPUU PT
125 ppm
250 ppm

Figure 1

POTENTIAL DISPOSAL SITES

Hazardous Waste Study

GEZR Oahu Hawaii

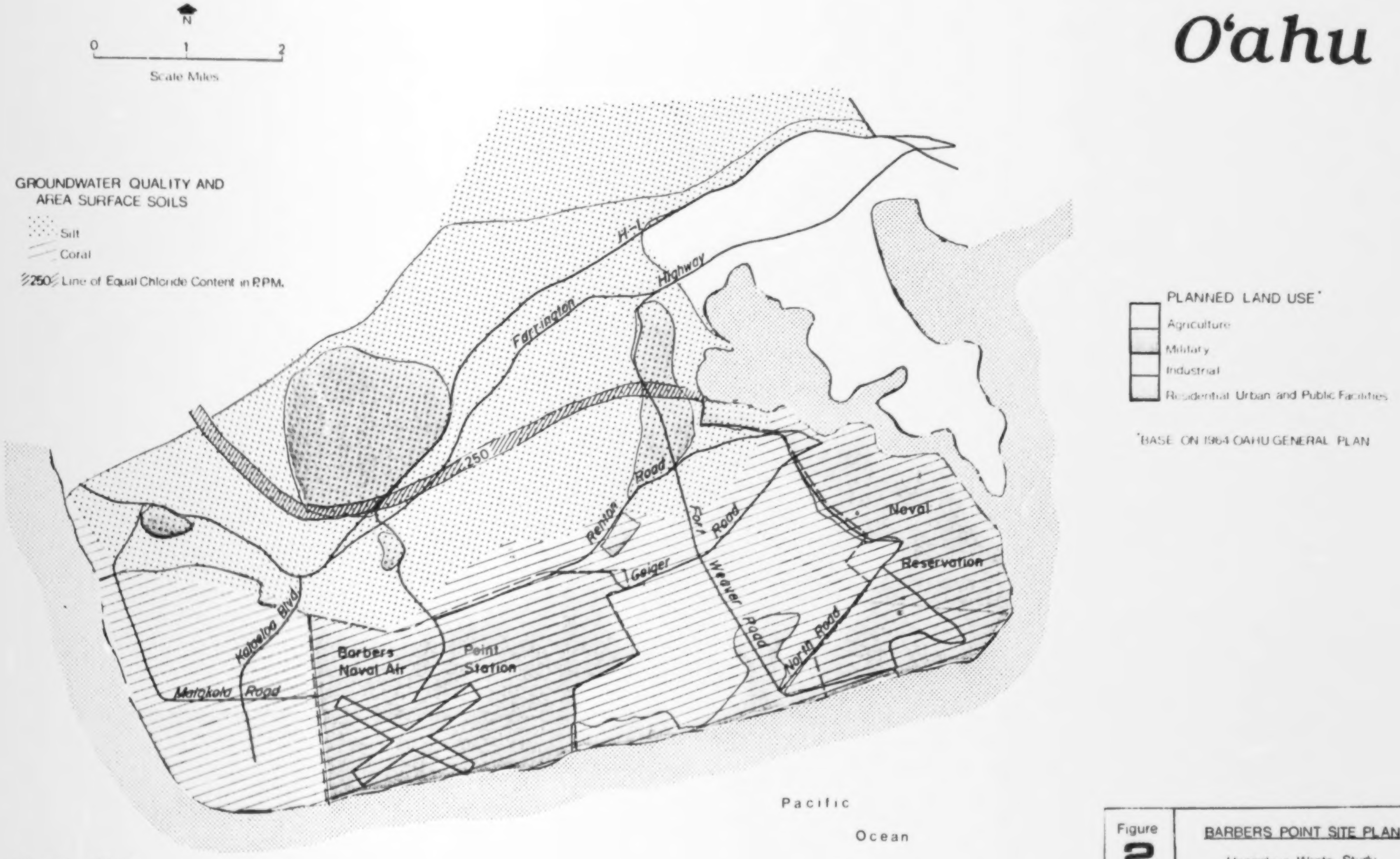

O'ahu
N
0 1 2
Scale Miles
GROUNDWATER QUALITY AND AREA SURFACE SOILS
Silt
Coral
250 Line of Equal Chloride Content in P.P.M.
PLANNED LAND USE*
Agriculture
Military
Industrial
Residential Urban and Public Facilities
*BASE ON 1964 OAHU GENERAL PLAN
H-1
Highway
Farrington
250
Renton
Road
Fort
Road
Weaver
Road
Geiger
Naval
Reservation
North Road
Kalaeloa Blvd
Malakole Road
Barbers
Naval Air
Point
Station
Pacific
Ocean

Figure **2** GEZR

BARBERS POINT SITE PLAN

Hazardous Waste Study

Oahu Hawaii

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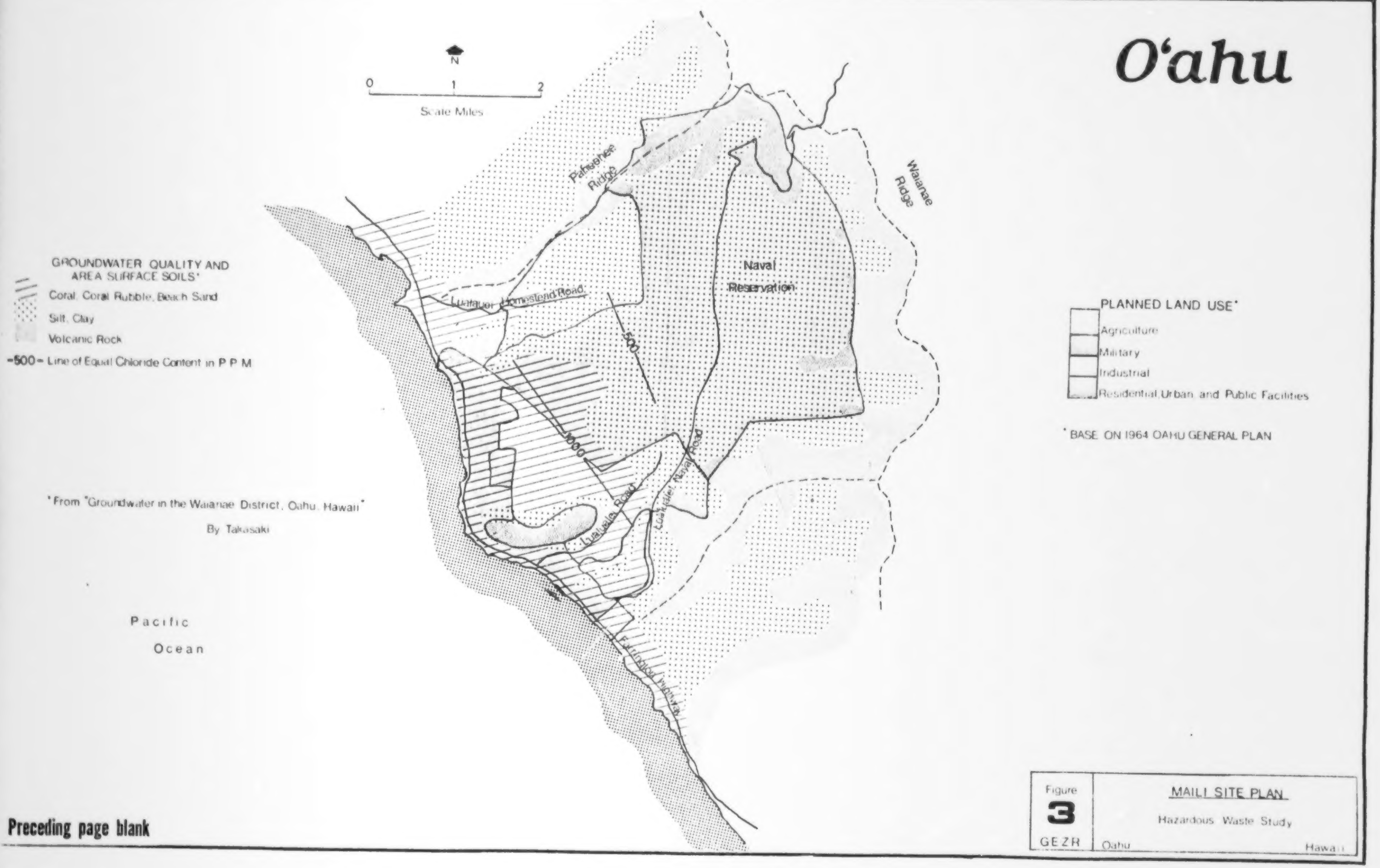
O'ahu
N
0
1
2
Scale Miles
Pahehehe Ridge
Waianae Ridge
Naval Reservation
Lualualei Homestead Road
500
1000
Lualualei Road
Lualualei Naval Road
Farrington Highway
Pacific
Ocean
GROUNDWATER QUALITY AND AREA SURFACE SOILS*
Coral, Coral Rubble, Beach Sand
Silt, Clay
Volcanic Rock
-500- Line of Equal Chloride Content in P P M
* From "Groundwater in the Waianae District, Oahu, Hawaii" By Takasaki
PLANNED LAND USE*
Agriculture
Military
Industrial
Residential, Urban and Public Facilities
* BASE ON 1964 OAHU GENERAL PLAN

Figure 3 GEZR

MAILI SITE PLAN

Hazardous Waste Study

Oahu Hawaii

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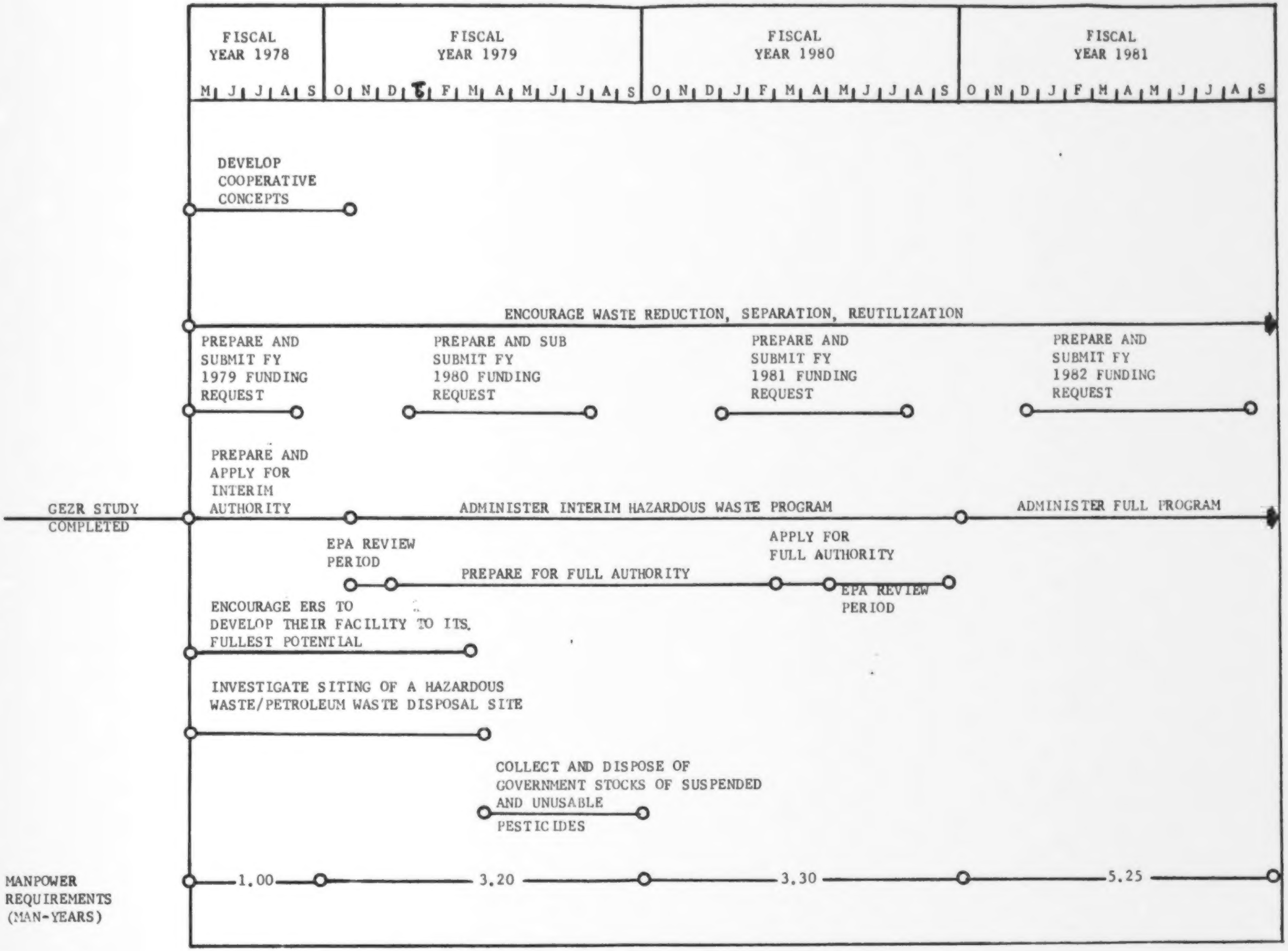
FIGURE 4

SCHEDULE OF STRATEGY TASKS



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PREPARED FOR

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HAZARDOUS WASTE MANAGEMENT

PROBLEM ASSESSMENT AND STRATEGY FORMULATION

chapter one:	*state of hawaii*
chapter two:	***territory of guam***
chapter three:	*territory of american samoa*
chapter four:	*government of northern marianas islands*
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INTRODUCTION

Background

Guam is the largest and most populated island between Hawaii and the Philippines. It is approximately 48 kilometers (30 miles) long and ranges from 6.4 to 12.8 kilometers (4.0 to 8.5 miles) in width. Total land mass is 546 square kilometers (210 square miles). Two major military installations, Anderson Air Force Base and the U. S. Naval Base - Guam, hold approximately one-third of the island's land. Government, construction, wholesale and retail trade, and the visitor industry provide most of the Territory's employment.

Summary of Chapter Findings and Recommendations

Hazardous waste generation and management practices were analyzed by reviewing past reports and conducting extensive field surveys of industrial and commercial enterprises and public agencies on the island of Guam.

TASK 1 IDENTIFICATION OF CONDITIONS

Although hazardous wastes generated in the Territory of Guam are limited, they pose a significant threat to a small island environment.

TASK 2 STORAGE

Hazardous wastes currently held in storage include:

- Suspended and unusable pesticides
- Various chemicals and chemical compounds
- Spent pesticide and chemical containers

TASK 3 PROJECTIONS

Quantities of hazardous wastes are projected to increase in the future. However, this increase is not expected to significantly change the magnitude of the problem or the management practices necessary to protect human health and the environment.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

Hazardous wastes which are currently managed in an environmentally unacceptable manner are:

- Spent pesticide containers
- Suspended and unusable pesticides

- Tank bottom sediments
- Tetraethyl lead sludge
- Waste lubricating oil

TASK 5 LAWS AND REGULATIONS

The Resource Conservation and Recovery Act of 1976 (PL94-580) requires the Federal Environmental Protection Agency (EPA) to establish and administer a nationwide hazardous waste management program. States and territories are allowed to implement a substantially equivalent program in lieu of the Federal program. If the territory does not, the Federal program will be put into effect and enforced by the EPA Region IX office. Additions to existing laws and regulations would be needed to fulfill requirements for territorial administration.

TASK 6 RECOMMENDED STRATEGY

The following recommendations provide for the proper management of hazardous wastes:

- Continue practices which are identified as environmentally acceptable.
- Spent pesticide containers must be triple-rinsed, punctured, and crushed, prior to burial at the Ordot landfill, in accordance with Federal EPA regulations.
- Suspended and unusable pesticides require disposal at a hazardous waste landfill. Storage prior to disposal should be in tightly closed containers in a cool, dry, secured area, with adequate ventilation.
- Petroleum bulk storage facilities should be encouraged to make arrangements for disposal of tank bottom sediments at GORCO's petroleum waste land farm. If this is not possible; tank bottom sediments should be buried in securely fastened drums in a specially designated area of the Ordot landfill.
- Tetraethyl lead sludge requires disposal in a hazardous waste landfill.
- To encourage GORCO and Guam Power Authority to reprocess/reuse waste lubricating oil, the Guam Environmental Protection Agency should develop and establish the feasibility of waste oil collection and reuse programs.

The quantities of wastes generated on Guam do not warrant siting a separate hazardous waste landfill. However, because small quantities are generated from time to time, it is recommended this be given consideration when selecting a replacement for the Ordot landfill.

TASK 1 IDENTIFICATION OF CONDITIONS

1A A Review and Summation of Existing Reports

No previous studies dealing with hazardous waste management in the Territory of Guam have been conducted.

1B Expected Types of Hazardous Wastes

Table 2-1 lists the types of wastes expected to be found in the Territory of Guam prior to conducting the survey.

1C Potential Hazardous Waste Generators

Potential hazardous waste producers in the Territory of Guam include:

- Construction firms
- Department of Agriculture
- Department of Education
- Department of Parks and Recreation
- Department of Public Works
- Guam Power Authority
- Hospitals
- Industry
- Military installations
- Public Utility Agency of Guam
- Service stations and garages

1D Survey Methodology

All industrial and construction firms, as well as the governmental agencies listed above, were interviewed individually to determine types and quantities of hazardous wastes. Military installations have not yet provided information concerning their hazardous waste practices. This information will be made available to the Guam Environmental Protection Agency when ascertained.

TABLE 2-1

EXPECTED TYPES OF HAZARDOUS WASTES

Source	Type
Agricultural	• Spent pesticide containers • Suspended and unusable pesticides
Governmental	• Digested sewage sludge • Spent pesticide containers • Suspended and unusable pesticides • Waste lubricating oils
Hospital/Pharmacy	• Expired and unusable medicines • Pathological wastes
Industrial/Commercial	• Lime slurry • Petroleum waste products • Spent pesticide containers • Suspended and unusable pesticides
Military	• Acids • Alkalies • Contaminated soil and sand • Chromium wastes • Dye/ink wastes • Inorganic wastes • Pathological/infectious wastes • Petroleum wastes • Sludges • Spent pesticide and chlorine containers • Spent photo chemicals • Suspended and unusable pesticides • Used solvents

1E Generation Rates

Table 2-2 summarizes the results of the survey. Data reported by the military on Guam is discussed in Appendix E.

TABLE 2-2 - HAZARDOUS WASTE GENERATION*, GUAM, 1977 (SHEET 1 OF 1)

Waste Material	Source	Annual Quantity
Digested Sludge (Dry Weight)	Wastewater Treatment Plant (Department of Public Works)	490 Metric Tons 550 English Tons
Hospital Wastes	Hospital	133,000 Kilograms 292,000 Pounds
Lime Slurry (Calcium Hydroxide)	Acetylene Manufacturing	82,000 Kilograms 180,000 Pounds
Petroleum Waste Products		
• Bilge Water	Tuna Ship Maintenance	15,000 Liters 4,000 Gallons
• Oil-Contaminated Sand	Refinery	164,000 Kilograms 361,000 Pounds
• Oil Sludge	Refinery	125,000 Liters 33,000 Gallons
• Tank Bottom Sediments	- Petroleum Bulk Storage Facilities (Tank Cleaning)	35,000 Liters 9,000 Gallons
	- Refinery	125,000 Liters 33,000 Gallons
• Tetraethyl Lead Sludge	Petroleum Bulk Storage Facilities (Tank Cleaning)	15,000 Liters 4,000 Gallons
	- Airport	4,000 Liters 1,000 Gallons
• Waste Lubricating Oils	- Construction Firms	171,000 Liters 45,000 Gallons
	- Department of Public Works (Government)	148,000 Liters 39,000 Gallons
	- Private Vehicles	595,000 Liters 157,000 Gallons
Spent Pesticide Containers** (Glass, Metal, Paper, Plastic)	Construction Firms and Pest Control Firms	60 Items
Water Treatment Residue	Bottling Plant	190,000 Liters 50,000 Gallons

* Does not include military.

** Assumes 30 gallon drum is average container size.

TASK 2 STORAGE

A significant quantity of banned and unusable pesticides are currently stored in the Territory of Guam. In addition, Guam Memorial Hospital and the dog pound are storing a small quantity of chemicals and chemical compounds. Approximately 190 liters (50 gallons) of waste oil are stored in a steel drum at the airport. A list prepared by the Guam Environmental Protection Agency is presented in Table 2-3.

TABLE 2-3 - PESTICIDES AND OTHER X-BRAND CHEMICALS (UPDATED JANUARY 1978), GUAM, 1977 (SHEET 1 OF 3)

Type of Pesticide/Formulation	Quantity Metric	 English	Name of Firm/Location	Remarks
Aldrite/E.C. (Liters/Gallons)	380	100	Department of Education, Maintenance Section/Piti	Requires Disposal
Ametryne 80/W.P. (Kilograms/Pounds)	19	41	Department of Agriculture/Mangilao	Requires Disposal
Ammonium Nitrate/Dust (Liters/Gallons)	19 (Four Drums)	5	Department of Agriculture/Mangilao	Requires Disposal
Arsenical Weed Killer/E.C. (Liters/Gallons)	380	100	Jack Peters and Company, Tamuning	Requires Disposal
Arsenic Pentoxide (Kilograms/Pounds)	2.7	6	Guam Memorial Hospital/Tamuning	Requires Disposal
Calcium Arsenate/Pellets (Kilograms/Pounds)	45	100	Department of Agriculture/Mangilao	Requires Disposal
Calcium Hypochlorite	Undetermined		Department of Agriculture/Mangilao	Requires Disposal
Chlordane 72%/E.C. (Liters/Gallons)	19	5	Department of Agriculture/Mangilao	Requires Disposal
Compound 1080/Dust (Kilograms/Pounds)	90	200	Department of Public Health/Mangilao	Requires Disposal
Cyanide Capsules Kits	3 Boxes		Dog Pound (PHSS)/Mangilao	Requires Disposal
Cyanide Shells Code 101 (Kilograms/Pounds)	0.09	0.2	Dog Pound (PHSS)/Mangilao	Requires Disposal
Cythion/Malathion (Liters/Gallons)	418 (Two Drums)	110	Department of Agriculture/Mangilao	Requires Disposal
Dalapon (Liters/Gallons)	209	55	Department of Agriculture/Mangilao	Requires Disposal
DCPB Nemagm 8.6/E.C. (Liters/Gallons)	57	15	Brewer Chemicals/Harmon, Indiana	Requires Disposal
DDT/Dust (Kilograms/Pounds)	273-455	600-1,000	Department of Agriculture/Mangilao	Requires Disposal
DDT/Dust (Kilograms/Pounds)	45	100	Department of Education, Maintenance Section/Piti	Requires Disposal
Dibrom 14 (Liters/Gallons)	42	11	Department of Agriculture/Mangilao	Requires Disposal
Dieldrin 1.5/E.C. (Liters/Gallons)	1,140	300	Black Construction/Harmon, Indiana	Requires Disposal
Ester (Liters/Gallons)	57	15	Department of Agriculture/Mangilao	Requires Disposal
Isoamyl Alc.(Liters/Gallons)	3.8	1	Guam Memorial Hospital/Tamuning	Requires Disposal
Lead Nitrate (Kilograms/Pounds)	0.45	1	Guam Memorial Hospital/Tamuning	Requires Disposal
Lindane/E.C. (Liters/Gallons)	3.8	1	Department of Agriculture/Mangilao	Requires Disposal
Malathion/W.P. (Kilograms/Pounds)	25	55	Department of Agriculture/Mangilao	Requires Disposal
Malathion/E.C. (Liters/Gallons)	1.9	0.5	Department of Agriculture/Mangilao	Requires Disposal
Malathion/ULV (Kilograms/Pounds)	208	458	Defense Logistics Agency DUD/Naval Station	Requires Disposal
Malathion-Related Chemicals Cyl Gas (Kilograms/Pounds)	4,113	9,049	Defense Logistics Agency DUD/Naval Station	Requires Disposal

TABLE 2-3 - PESTICIDES AND OTHER X-BRAND CHEMICALS (UPDATED JANUARY 1978), GUAM, 1977 (SHEET 2 OF 3)

Type of Pesticide/Formulation	Quantity Metric	English	Name of Firm/Location	Remarks
Medicide DCPB/Granules (Kilograms/Pounds)	114	250	Brewer Chemical/Harmon, Indiana	Requires Disposal
Mercuric Acetate (Kilograms/Pounds)	0.11	0.25	Guam Memorial Hospital/Tamuning	Requires Disposal
Mercuric Bichloride (Kilograms/Pounds)	0.45	1	Guam Memorial Hospital/Tamuning	Requires Disposal
Nemagon/Dust (Liters/Gallons)	209	55	Department of Agriculture/Mangilao	Requires Disposal
Neutroleum Alpha (Repellant)/E.C.	(One Box)		Dog Pound (PHSS)/Mangilao	Requires Disposal
Pheno Barbital (Kilograms/Pounds)	0.11	0.25	Guam Memorial Hospital/Tamuning	Requires Disposal
Polybor-Chlorite/Dust (Kilograms/Pounds)	227	500	Imamura Pest Control Company/Tamuning	Requires Disposal
Sodium Arsenite/E.C. (Liters/Gallons)	4,560	1,200	Windward Hill Golf Course and Country Club/Yona	Requires Disposal
Strychnine Antidote	(Two Boxes and Three Cans)		Dog Pound (PHSS)/Mangilao	Requires Disposal
Strychnine Alkaloid/W.P.	(One Box)		Dog Pound (PHSS)/Mangilao	Requires Disposal
Sulfate (Liters/Gallons)	1.9	0.5	Department of Agriculture/Mangilao	Requires Disposal
Synthetic Resin (Kilograms/Pounds)	0.11	0.25	Guam Memorial Hospital/Tamuning	Requires Disposal
TOK/W.P.-50 (Kilograms/Pounds)	2.3	5	Department of Agriculture/Mangilao	Requires Disposal
Tordon 212 (Liters/Gallons)	19	5	Department of Agriculture/Mangilao	Requires Disposal
Trichloroethane (Liters/Gallons)	3.8	1	Guam Memorial Hospital/Tamuning	Requires Disposal
Triton (Liters/Gallons)	3.8	1	Department of Agriculture/Mangilao	Requires Disposal
Vapam/E.C. (Liters/Gallons)	209 (Eleven Drums)	55	Department of Agriculture/Mangilao	Requires Disposal
Vapam/E.C. (Liters/Gallons)	380	100	Black Construction/Harmon, Indiana	Requires Disposal
Vegadox Liquid/E.C. (Liters/Gallons)	3.8	1	Department of Agriculture/Mangilao	Requires Disposal
WK-90/E.C. (Liters/Gallons)	380	100	Black Construction/Harmon, Indiana	Requires Disposal
2 4-D Amine (Liters/Gallons)	57	15	Department of Agriculture/Mangilao	Requires Disposal
2 4-D Low Volatile	Four Drums		Department of Agriculture/Mangilao	Requires Disposal
X-Brand Chemicals (Liters/Gallons) (Kilograms/Pounds)	855 482 Seven Drums Fifty Bags Forty Plastic Containers	225 1,060	Department of Agriculture/Mangilao Department of Agriculture/Mangilao Department of Agriculture/Mangilao Department of Agriculture/Mangilao Department of Agriculture/Mangilao	Requires Disposal Requires Disposal Requires Disposal Requires Disposal Requires Disposal

TABLE 2-3 - PESTICIDES AND OTHER X-BRAND CHEMICALS (UPDATED JANUARY 1978), GUAM, 1977 (SHEET 3 OF 3)

Type of Pesticide/Formulation	Quantity Metric	Quantity English	Name of Firm/Location	Remarks
X-Brand Pesticides/Dust (Kilograms/Pounds)	9.1	20	Department of Parks and Recreation/Asan	Requires Disposal
X-Brand Fertilizers/Granules (Kilograms/Pounds)	136	300	Department of Parks and Recreation/Asan	Requires Disposal
X-Brand Chemicals/E.C. (Liters/Gallons)	190	50	Perez Brothers, Incorporated/Agana	Requires Disposal
X-Brand Chemicals/E.C. (Liters/Gallons)	1,140	300	Department of Education, Maintenance Section/Piti	Requires Disposal
X-Brand Pesticides/E.C. (Liters/Gallons)	760	200	Black Construction/Harmon, Indiana	Requires Disposal
X-Brand Chemicals/E.C. (Liters/Gallons)	380	100	Black Construction/Harmon, Indiana	Requires Disposal
X-Brand Chemicals/E.C. (Liters/Gallons)	36,900	9,715	Defense Logistics Agency DUD/Naval Station	Requires Disposal
Spent Containers Sodium Flouroacetate Compound 1080	Ninety Boxes Undetermined		Dog Pound (PHSS)/Mangilao Dog Pound (PHSS)/Mangilao	Requires Disposal Requires Disposal

TASK 3 PROJECTIONS

Projections of sewage sludge quantities are presented in Table 2-4. Projections of other hazardous waste generation are presented in Table 2-5. Methodology utilized in preparing projections is discussed below.

3A Digested Sludge

Projections of sludge generation were provided by the Guam Environmental Protection Agency.

3B Hospital Wastes

It is assumed generation of hospital wastes will parallel population growth. The growth rate was derived from a straight-line interpolation of population projections provided by the Guam Environmental Protection Agency.

3C Industrial/Commercial Wastes

Wastes generated by the industrial and commercial sectors were projected based on information obtained from individual interviews during field investigations.

3D Pesticide Containers

Pesticides in Guam are primarily used for residential and commercial pest control, weed control during construction projects, and agriculture, all of which are directly related to the island's population. Therefore, it is assumed pesticide container generation will parallel population growth.

3E Refinery Wastes, Other Waste Oil Materials, and Process Residues

The major industrial generator of tank bottom sediments, oil sludge, and oil-contaminated sand is the Guam Oil and Refining Company (GORCO). They are currently operating at about 60 percent of the small business production limit. For planning purposes, it is assumed they will increase capacity up to that limit over the next ten years. Waste oil generation from construction firms, governmental operations, and private vehicles is expected to parallel population growth.

TABLE 2-4 - SOURCE AND AMOUNT OF ANTICIPATED SEWAGE TREATMENT PLANT SLUDGE, GUAM, 1977 (SHEET 1 OF 1)

Sewage Treatment Plant	Design Flow (mgd)	Estimated Daily Sludge and Wet Weight (Dry Weight 60%)*	Sludge Treatment	Sludge Drying Method
Northern District STP (Planned)	12.0	11.3 Metric Tons 4.5 English Tons	Anaerobic Digestion	Centrifuge
Agana STP (Under Construction)	11.5	10.8 Metric Tons 4.3 English Tons	Aerobic Digestion	Centrifuge
Agat STP (Existing)	0.7	0.7 Metric Tons 0.3 English Tons	Aerobic Digestion	Drying Beds
Baza Gardens (Existing)	0.6	0.6 Metric Tons 0.2 English Tons	Aerobic Digestion	Drying Beds
Other Facilities (Existing):		0.2 Metric Tons 0.01 English Tons	Hauled to Agat STP	
• Pago Bay	0.06			
• Commercial Port	0.05			
• Marianas Terrace**	0.05			
• Yona**	0.10			
TOTALS	24.9	23.4 Metric Tons 9.3 English Tons***		

* Assume 60 percent moisture and normal sewage strength of 200 mg/1. B.O.D., 200 mg/1 suspended solids.

** To be discontinued.

*** This would occupy 1,419 cubic feet.

TABLE 2-5 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, GUAM, 1977 (SHEET 1 OF 1)

Waste Material	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Hospital Wastes (Kilograms/Pounds)	133,000	292,000	161,000	354,000	190,000	417,000
Lime Slurry (Kilograms/Pounds)	82,000	180,000	55,000	121,000	55,000	121,000
Petroleum Waste Products						
• Bilge Water (Liters/Gallons)	15,000	4,000	16,000	4,200	18,000	4,800
• Oil-Contaminated Sand (Kilograms/Pounds)	164,000	361,000	219,000	482,000	273,000	601,000
• Tank Bottom Sediments (Liters/Gallons)	160,000	42,000	215,000	57,000	268,000	71,000
• Tetraethyl Lead Sludge (Liters/Gallons)	15,000	4,000	18,000	5,000	21,000	6,000
• Waste Lubricating Oil (Liters/Gallons)	918,000	242,000	1,125,000	296,000	1,315,000	346,000
Spent Pesticide Containers (Items)	60 Items		75 Items		85 Items	
Water Treatment Residue (Liters/Gallons)	190,000	50,000	207,000	55,000	225,000	59,000
Population	84,701		102,709		120,718	

It is assumed tank bottom sediment generation by the two petroleum bulk storage operations on island, resulting primarily from fuel storage, will parallel electricity production trends.

It is assumed tetraethyl lead sludge generation by the two petroleum bulk storage operations, resulting primarily from leaded gasoline storage, will parallel the growth in number of automobiles.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

4A Identified Haulers and Storage, Processing, and Disposal Site Operators

Cesspool pumpers are reportedly collecting and hauling waste oil. There are no other commercial hazardous waste haulers or processors in Guam. Most wastes are stored or disposed on-site, or transported to the Ordot landfill by the generator.

4B Evaluation Criteria

Criteria for minimum acceptable standards for certain hazardous waste management practices appear in Appendix B.

4C Investigation of Identified Operations

Field surveys of all identified storage and disposal operations were undertaken in July 1977. Desctiptions and evaluations of current hazardous waste management practices are presented in the following section (4D).

4D Evaluation of Practices

Evaluations of the various identified hazardous waste management operations in light of criteria developed in Section 4B are summarized in Table 2-6. Evaluations of military practices are presented in Appendix E.

4D.1 Digested Sewage Sludge

Digested sludge from the Commercial and Agat Treatment Plants is dried on sand beds and distributed for horticultural use. Due to absence of toxic industrial waste in the sewage which could contaminate the sludge, this practice is considered acceptable.

4D.2 Disposal of Refinery Wastes, Spent Lubricating Oil, and Other Oily Wastes

The Guam Oil and Refinery Company (GORCO) recently began operation of a waste oil farming system to dispose of oil sludges, skimmings, contaminated sand, and tank bottom sediments. The waste products are collected from various points and pumped to a 5.7 hectare (14 acre) bermed area, where water is allowed to evaporate. The waste products are disced into the top six inches of soil to allow biodegradation. This method of refinery waste disposal has been very successful in other areas and should prove to be acceptable at this site. GORCO has the capability to rerefine waste lubricating oils and has, on occasion, reprocessed waste oil from other firms.

TABLE 2-6 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, GUAM, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Digested Sewage Sludge (Commercial and Agat)	Sand Beds (Yes)	None	Air Drying (Yes)	Distributed for Horticultural Use (Yes)
Lime Slurry (Calcium Hydroxide)	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (Yes)
Oil-Contaminated Bilge Water	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (Yes)
Oil-Contaminated Sand	Concrete Basin (Yes)	Truck (Yes)	Biodegradation (Yes)	Waste Oil Farming (Yes)
Pathological/Infectious Wastes	Plastic Bags (Yes)	Hand/Truck (Yes)	None	Incineration (Yes)
Spent Pesticide Containers	None	None	Rinsing (No)	Buried at Point of Use (No)
Suspended and Unusable Pesticides	Locked Storehouse (Yes); Unlocked Shed (No); Tarped (No); Open to Weather (No)	N/A	N/A	N/A
Tank Bottom Sediments	None; Steel Drums (Yes)	Pipe Network (Yes); Truck (Yes)	Biodegradation (Yes)	Waste Oil Farming (Yes); Buried at Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Waste Oil:				
• Airport	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
• Government	Steel Drums (Yes)	Truck (Yes)	None	Dust Control (No)
• Industry - 90 Percent	Concrete Tanks (Yes)	Pipe Network (Yes)	Evaporation/Biodegradation (Yes)	Waste Oil Farming (Yes)
- 5 Percent	Pond (Yes)	None	None	Open Burning (No)
- 3 Percent	Steel Drums (Yes)	Truck (Yes)	None	Dust Control (No)
- 2 Percent	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Water Treatment Residue	None	None	None	Sewers (Yes)

The Public Works Department, as well as most construction companies, utilizes waste lubricating oil for dust control. While this is a common practice throughout the United States, it is not the optimum use of waste oil. Disposal of waste oil in this manner creates potential for ground and surface water contamination, primarily due to heavy metal additives contained in many lubricating oils. Disposal of waste oils by the airlines and construction companies at the landfill is not considered environmentally acceptable. Oil-contaminated bilge water is sealed in steel drums and buried in the Ordot landfill. This practice meets the minimum criteria, provided drums are confined to one area of the site and records are kept indicating quantity, date, and location.

4D.3 Other Industrial Wastes

Lime slurry (calcium hydroxide) produced as a by-product of acetylene manufacturing is hauled twice yearly to the Ordot landfill. This practice is considered environmentally acceptable. Other possible uses include mixing with acidic soils or use at a sewage treatment plant.

Water treatment residue from soft drink bottling is disposed of to the sewer system. The small quantity produced in relation to the sewage treatment plant's capacity allows the practice to be considered acceptable.

4D.4 Pathological Wastes

The pathological wastes from both hospitals is incinerated at the Medical Center of the Marianas. The incinerator (P & T Manufacturing, Inc. Model No. PU50) provides adequate high temperature and residence time to insure sterilization. The operator estimates 725 kilograms (1,600 pounds) could be incinerated each day. This capacity exceeds the ten-year projected quantity.

4D.5 Spent Pesticide Containers

Pesticide containers are rinsed and buried on-site. This practice is considered acceptable only if containers are properly triple-rinsed, punctured, and crushed, in accordance with EPA regulations.

4D.6 Suspended and Unusable Pesticides and Miscellaneous Chemical Compounds

These wastes are currently being stored in locked storehouses, unlocked sheds, outside under tarps, and totally unprotected. Due to the high toxicity of this material, storage in locked storehouses which provide complete protection from the weather is the only acceptable method currently practiced.

4D.7 Tank Bottom Sediments and Tetraethyl Lead Sludge

Petroleum products storage tanks at the bulk distribution facility are cleaned periodically. The tank bottom sediment, a mixture of rust, oil, sand, dirt, and water, is collected and transported in steel drums. The sediments are dumped at the landfill and drums are reused. Tetraethyl lead sludge, generated during periodic cleaning of the leaded gasoline storage tank, is handled in a similar manner. Due to potential ground and surface water contamination associated with landfilling these oily and heavy metal containing materials, neither of these wastes is considered managed in an environmentally acceptable manner.

TASK 5 LAWS AND REGULATIONS

5A A Review of Existing Laws, Regulations, Ordinances Dealing With Hazardous Wastes

Federal statutes affecting management of hazardous wastes are summarized in Table 2-7 and described in Appendix B. Territorial statutes affecting hazardous waste management are described below:

5A.1 Public Law 14-37

This law defines hazardous wastes and authorizes an investigation to set standards for storage, treatment, and disposal of such wastes. Handling of hazardous wastes in any manner that would degrade the environment or create a health or safety problem is prohibited.

5A.2 Draft Pesticide Regulations

This regulation (based upon the Guam Pesticide Act) prohibits storage or disposal of pesticides in any manner that might create a hazard. It states that reusable empty containers may only be refilled with the same pesticide they initially contained unless authorized for other reuse by the Administrator, Guam Environmental Protection Agency, and unusable empty containers must be cleaned, crushed, and buried at least one foot deep and away from any ground water system.

5B A Guide for a Hazardous Waste Management Program (Reference 17)

The Resource Conservation and Recovery Act of 1976 (PL94-580), Section 3001 through 3010, requires the Federal Environmental Protection Agency to establish standards and promulgate regulations for proper management of hazardous wastes. States and territories are allowed the opportunity to develop and administer substantially equivalent programs in lieu of the Federal program. Grant money has been appropriated for two years to finance up to 75 percent of the program. At this time, it is undetermined whether financing will be continued. If the state or territory does not elect to administer a program, the Federal program will be put into effect and enforced by the appropriate regional EPA office.

There are several important advantages to local control of the program. These include:

(1) The program can be tailored to meet local conditions. The current EPA draft regulations appear to be aimed at highly industrialized areas of the United States and are in part inappropriate to hazardous waste problems unique to the islands in the Pacific Basin.

TABLE 2-7

FEDERAL STATUTES DEALING WITH HAZARDOUS WASTE MANAGEMENT

Statute/ Administering Agency	Description
Resource Conservation and Recovery Act of 1976 (PL94-580)/Environmental Protection Agency	Places primary responsibility to regulate management of hazardous wastes on EPA.
Toxic Substances Control Act of 1976 (PL94-469)/EPA	Authorizes research and regulation of those substances found to be hazardous.
Section 112 of the Clean Air Act Amendments of 1970 (PL91/604)/EPA	Authorizes the setting of standards for hazardous air pollutants and controls the incineration of hazardous wastes.
Federal Water Pollution Control Act Amendments of 1972 (PL92-500)/ EPA	Authorizes control over toxic pollutants discharged into water from point sources, the removal of toxic pollutants from critical port and harbor areas, and a plan describing the process for the disposal of pollutants.
National Environmental Policy Act of 1969 (NEPA) (PL91-190)/Not Specified	Requires the preparation of an Environmental Impact Statement for all Federal hazardous waste management activities.
The Occupational Safety and Health Act of 1970 (OSHA) (PL91-596)/ Department of Labor	Authorizes the setting of mandatory standards to protect people working with hazardous materials.
The Poison Prevention Packaging Act of 1970 (PL91-601)/Department of Health, Education, and Welfare	Authorizes the establishment of special packaging standards for hazardous household substances.
The Federal Hazardous Substances Labelling Act of 1960 (PL86-613)/ Department of Transportation (DOT)	Prohibits the transport of hazardous substances that have been misbranded or the labels have been removed.
Hazardous Materials Control Act of 1970 (PL91-458)/DOT	Authorizes an evaluation of the hazards associated with transporting hazardous materials.

* Reference 16.

TABLE 2-7 - (Continued)

Statute/ Administering Agency	Description
Transportation of Explosives Act (U. S. Code, Title 18, Chapter 39)/ DOT	Prohibits the unregulated transport of dangerous materials.
The Safety Regulation of Civil Aeronautics Act of 1958 (PL85-726)/Federal Aviation Administration of DOT	Authorizes FAA to develop air transportation standards to provide adequate safety.
The Hazardous Cargo Act (U. S. Code, Title 46, Chapter 7)/U. S. Coast Guard	Places controls on the water transport of dangerous substances
The Food, Drug, and Cosmetic Act Animal Drug Amendments of 1968 (PL90-399)/Not Specified	Prohibits the misbranding of certain consumer items.
The Marine Protection Research and Sanctuaries Act of 1972 (PL92-532)/ EPA	Prohibits the transport for ocean dumping of many extremely hazardous wastes.
The Coastal Zone Management Act of 1972 (PL92-583)/Not Specified	Requires that coastal management agencies regulate hazardous waste disposal.
Section 212 of the Resource Recovery Act of 1970 (PL91-512)/EPA	Requests a study of the feasibility of a system of national hazardous waste disposal sites.
Safe Drinking Water Act of 1974 (PL93-523)/EPA	Authorizes regulation of underground injection of toxic wastes.
The Atomic Energy Act of 1954, as Amended (PL83-703)/NRC and Private Industry	Authorizes the management of radioactive wastes generated in fission reactions.
The Armed Forces Appropriation Authorization Acts of 1969 and 1976 (PL91-121; PL91-441)/Not Specified	Limits the use of Federal funds for disposal of chemical and biological warfare agents.
The Federal Environmental Pesticide Control Act of 1972 (PL92-516)/EPA	Requires the establishment of procedures and regulations for the disposal of pesticides.

(2) Portions of the required program are already in existence locally (the pesticide program, for example). Implementing the full program will avoid duplication by a Federal agency of programs already established on a local level.

(3) Communications between the various islands in the Pacific Basin and EPA Region IX (San Francisco) are difficult and expensive. This will place a significant burden on industry, environmentalists, and others in representing their interests, receiving technical guidance, appealing decisions, etc.

Section 3006 of this law allows the Territory to apply for interim authority to conduct the program. This allows the Territory two years to comply with all requirements for full authorization while offering immediate eligibility for grant funding. Requirements for partial authorization are as follows:

- Establishment of legislative authority to control on-site and off-site disposal of hazardous wastes.
- Identification of resources (manpower, matching funds, etc.) to conduct the program.
- Development of a hazardous waste disposal permit system which is substantially equivalent to the Federal system.
- Establishment of surveillance and enforcement procedures.
- Development of a plan to bring all elements of program into compliance with requirements for full authorization by October 21, 1980.

Application should be made to the Administrator of EPA Region IX between July 20 and October 20, 1978.

The following is a guideline for development of a hazardous waste management program consistent with current draft EPA regulations, promulgated under PL94-580. Table 2-8 displays existing laws and regulations anticipated to satisfy guideline requirements and suggests appropriate actions to establish a program substantially equivalent to the Federal program.

5B.1 Legislative Authority to Establish Standards for Hazardous Wastes

TABLE 2-8 - RECOMMENDED HAZARDOUS WASTE REGULATORY ACTION, GUAM, 1977 (SHEET 1 OF 2)

Program Guideline	Existing Law/Regulation/Ordinance	Recommended Action
A. Legislative Authority*	PL14-37, Sections 57170 and 57172	None
B. Hazardous Waste Criteria	PL14-37, Section 57171	**
C. Standards Applicable to Generators		
• Record-keeping	--	***
• Labelling	--	***
• Containerization	--	***
• Information provided to transporters	--	***
• Manifest system	--	***
• Report submission	--	***
D. Standards Applicable to Transporters		
• Record-keeping	--	***
• Transporting properly labelled wastes only	--	***
• Manifest system	--	***
• Transporting waste to permitted facilities	--	***
• Coordination with regulations of Department of Transportation	--	***
E. Standards Applicable to Owners/Operators of Waste Treatment, Storage, and Disposal Facilities		
• Record-keeping	--	***
• Reports	--	***
• Standards for design, operation, and construction of facilities	--	***
• Location of facilities	--	***
• Facility monitoring and inspection	--	***
• Contingency plans	--	***
• Training of facility personnel	--	***
• Maintenance of facilities	--	***
• Ownership, continuity of operations, and financial responsibility	--	***
• Performance standards necessary to protect the environment and human health	--	***

* *Required for interim authorization.*

** Sufficient definition is not provided. Criteria and hazardous waste listing should be developed more fully.

*** Adopt regulations which meet EPA hazardous waste standards and requirements to be promulgated under PL94-580.

TABLE 2-8 - RECOMMENDED HAZARDOUS WASTE REGULATORY ACTION, GUAM, 1977 (SHEET 2 OF 2)

Program Guideline	Existing Law/Regulation/Ordinance	Recommended Action
F. Permits for Treatment, Storage, or Disposal of Hazardous Wastes		
• Content of application	--	***
• Issuance procedure	PL14-37, Section 57172	****
• Time limitation to bring facility into compliance	--	***
• Permit revocation procedure	PL14-37, Sections 57172 and 57173	***
G. Preliminary Notification		
• Require notification by handlers of identified hazardous wastes	--	***
H. Enforcement Provisions*		
• Enforcement staff and funding	PL14-37, Section 57172	****
• Authority to inspect facilities, copy records, and obtain samples	Draft Pesticide Regulation, Section 8	*****
• Delineation of agency responsibility	PL14-37, Section 57172	****
I. Compliance Provisions*		
• Procedure for informing violators	PL14-37, Section 57175	****
• Civil and criminal penalties	PL14-37, Section 57181	****

* Required for interim authorization.

** Sufficient definition is not provided. Criteria and hazardous waste listing should be developed more fully.

*** Adopt regulations which meet EPA hazardous waste standards and requirements to be promulgated under PL94-580.

**** Refers to the general definition of solid waste. A similar regulation, specifically addressing hazardous waste and meeting standards and requirements to be promulgated under PL94-580 should be adopted.

***** Refers to pesticides only. A similar regulation, addressing all categories of hazardous wastes and meeting standards and requirements to be promulgated under PL94-580, should be adopted.

5B.2 Hazardous Waste Criteria

- Establishment of criteria for identification of hazardous wastes (toxicity, persistence, flammability, corrosiveness, infectiousness, reactiveness, radioactivity).

- Establishment of a list of particular hazardous wastes which will be subject to regulation.

5B.3 Issuance of Standards Applicable to Generators of Hazardous Wastes

- Record-keeping practices accurately identifying quantity, composition, and disposition of hazardous wastes generated.

- Labelling practices for any containers of hazardous wastes.

- Containerization per U. S. Department of Transportation (DOT) requirements.

- Furnishing of information on general chemical composition of hazardous waste to persons transporting, treating, storing, or disposing of the wastes.

- Use of a manifest system to assure all hazardous wastes generated are designated for treatment, storage, or disposal at facilities for which permits have been obtained.

- Submission of reports to a responsible agency setting out quantities generated and disposition means.

5B.4 Issuance of Standards Applicable to Transporters of Hazardous Wastes

- Record-keeping concerning hazardous wastes transported, including their source and delivery points.

- Transportation of hazardous wastes only if properly labelled and containerized.

- Compliance with the manifest system.

- Transportation of hazardous wastes only to permitted facilities.

- Coordination with DOT regulations.

5B.5 Issuance of Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- Record-keeping of hazardous wastes accepted and the manner in which wastes were treated, stored, or disposed.
- Submission of reports with respect to manifest violations, accidents, operating conditions, and monitoring.
- Treatment, storage, or disposal of hazardous wastes received pursuant to approved procedures.
- Location, design, and construction of hazardous waste treatment, disposal, or storage facilities.
- Monitoring of air and ground water/leachate and regular inspection of facility operations.
- Contingency plans for effective action to minimize unanticipated damage from any treatment, storage, or disposal of any hazardous waste.
- Training of all facility personnel which is approved by the permitting agency.
- Maintenance of facility.
- Ownership, continuity of operations, and financial capability to cover possible accidents and closure costs.
- Performance necessary to protect the environment and human health.
- Landfills must be underlined with 10 feet of soil having a permeability of 10^{-8} centimeters per second or be constructed with a leachate collection system.
- Incinerators must achieve 99 percent combustion efficiency and operate above 1,000°C (1,832°F) for two seconds, or equivalent.

5B.6 Permits for Treatment, Storage, or Disposal of Hazardous Wastes

- Require each owner or operator to submit specified information in the permit application to ensure permitting agency can make the most efficient and expedient determination possible.
- Mandate time limits for application submission and review process within which both permitting agency and applicant or permitter must act.

- Require a compliance schedule to bring existing facilities into compliance with the act.
- Establish revocation procedures and circumstances.

5B.7 Preliminary Notification

- Require notification by hazardous waste handlers within 90 days of promulgations of regulations.

5B.8 Enforcement Provisions

- Establishment of enforcement staff and adequate budget allocations to carry out program.
- Establishment of authority to inspect facilities, copy records, and obtain samples.

5B.9 Compliance Provisions

- Establishment of procedures for informing violators.
- Establishment of civil and criminal penalties.

TASK 6 RECOMMENDED STRATEGY

6A Alternatives to Environmentally Unacceptable Practices

Alternatives for handling and disposing of wastes identified in Task 4D as presently managed in an environmentally unacceptable manner are presented in Table 2-9.

6B Evaluation of Alternatives

Alternatives presented in Table 2-9 are evaluated in the following sections.

6B.1 Pesticide Containers

Spent pesticide containers should be triple-rinsed, punctured, and crushed. To reduce pesticide container disposal sites and control disposal operation and location, disposal should be limited to the Ordot landfill.

6B.2 Suspended and Unusable Pesticides

One recommended process for treating most pesticides held in storage (chlorinated hydrocarbons) is incineration (Reference 13). However, the nearest incinerator facility, Energy Recovery Systems, in Hawaii, would require $75,000 worth of modifications to incinerate pesticides.

Alternatives to incineration are:

- Disposal at a hazardous waste landfill
- Shipment back to vendor for remanufacturing
- Soil application

There are no existing hazardous waste landfills on Guam. Cost of developing such sites depend on site-specific conditions. Approximate costs for installing artificial liners as reported in Reference 23 are as follows:

Liner Type	Cost/Acre (1973)
Clay (18 inch)	$1,185
Asphalt	$6,000-$12,000
Rubber	$11,000-$22,000
Hypalon	$11,000-$22,000
Polyvinyl Chloride (PVC)	$4,840-$9,680

TABLE 2-9 - ALTERNATIVES TO PRESENT ENVIRONMENTALLY UNACCEPTABLE PRACTICES, GUAM, 1977 (SHEET 1 OF 1)

Hazardous Waste	Storage	Transport	Recovery/ Reuse	Treatment	Disposal Point
Pesticide Containers	--	--	--	Triple-Rinsed/Punctured/Crushed	Ordot Landfill
Suspended and Unusable Pesticides	Tightly Closed Containers in Cool, Dry, Secured Area, With Adequate Ventilation	DOT Regulations*	Remanufacture	Incineration;** Biodegradation	Modified ERS Facility on Oahu; Hazardous Waste Landfill; Soil Application
Tank Bottom Sediments	--	--	--	Biodegradation	GORCO Petroleum Waste Land Farm
Tetraethyl Lead Sludge	Steel Drums	DOT Regulations*	--	--	Hazardous Waste Landfill
Waste Lubricating Oil	--	--	Reclaim/Recycle	Reprocess	GORCO; Guam Power Authority

* Department of Transportation.

** Arsenic compounds should not be incinerated.

Shipment to California for disposal at a Class I landfill is a practice which has been used in the past for disposing of hazardous wastes generated in the Pacific Basin. Costs for transportation to and disposal in California are presented in Appendix D. Anticipated EPA guidelines for hazardous waste transportation require containerization accordant with Department of Transportation (DOT) regulations (49CFR 100-189) or the National Motor Freight Classification when DOT stipulations do not apply.

Applying biodegradable pesticides to the soil has been researched. Table 2-10 evaluates this practice for selected pesticides (Reference 22). None of the pesticides reported in Table 2-3 lend themselves to such an application.

Because most of these pesticides are privately owned and stored, coordinating and implementing an island cleanup would be extremely difficult, if not impossible. Requiring private firms to comply with standards and guidelines for adequate storage to be promulgated by EPA will motivate some to dispose of their pesticides. Requesting private firms to notify the surveillance agency of planned disposal will also help prevent illegal disposal.

6B.3 Tank Bottom Sediments

Tank bottom sediments do not require disposal at hazardous waste facilities. However, the Ordot landfill does not provide sufficient protection against ground water contamination. Instead, tank bottom sediments should be disposed of at a petroleum waste land farm.

As mentioned in Section 4D.1, GORCO has recently begun operating such a land farm. Petroleum bulk storage facility operators should coordinate disposal with GORCO.

6B.4 Tetraethyl Lead Sludge

Tetraethyl lead sludge requires disposal in a hazardous waste landfill because of its toxic organic lead content.

6B.5 Waste Lubricating Oil

Lubricating oil, particularly troublesome in an island environment, is reclaimable. Recovery should be given highest priority. It can be rerefined for reuse as a lubricant or utilized as a supplemental fuel oil.

GORCO has the capability to rerefine waste lubricating oils and has on occasion reprocessed waste lubricating oils and has occasionally reprocessed waste oil from other firms. This practice should be encouraged. In addition, Guam Power Authority should be encouraged to reuse waste oil as supplemental boiler fuel.

TABLE 2-10

FEASIBILITY OF SOIL DISPOSAL FOR SUSPENDED AND/OR UNUSABLE PESTICIDES*

	Soil Disposal		Soil Disposal
Herbicides		**Insecticides**	
• Atrazine	No	• Aldrin	No
• Bromacil	?	• Chlordane	No
• CDAA	?	• Chlordecone (Kepone)	No
• Chloroamben	Yes	• DDT	No
• 2,4-D	Yes	• Dieldrin	No
• Dicamba	?	• Endosulfan	No
• Diquat	No	• Endrin	No
• Diuron	No	• Heptachlor	No
• EPTC	Yes	• Methoxychlor	Yes
• Linuron	No	• Mirex	No
• Monolinuron	No	• Toxaphene	No
• Monuron	No	• Azinphosmethyl	?
• Nitralin	Yes	• Diazinon	?
• Paraquat	No	• Disulfoton	?
• Picloram	No	• Malathion	Yes
• 2,4,5-T	?	• Methyl Parathion	?
• Trifluralin	Yes	• Parathion	?
		• Phorate	?
Miscellaneous		• Carbaryl	Yes
		• Metalkamate (Bux)	Yes
• Captan	Yes		
• Dicofol	No		
• Dodine	?		
• Maneb	?		
• Methyl Bromide	No		
• Nabam	?		
• Pentachlorophenol	No		
• Zineb	?		

* Reference 22.

These facilities have capacity to reclaim or utilize all waste oil generated.

Dusting roads with waste oil does not constitute reclamation nor enhance environmental quality. It should be prohibited.

6C Identification of Potential Sites for Hazardous Waste Disposal

The quantities of hazardous waste generated on Guam do not warrant the siting of a hazardous waste landfill. However, because small quanities are generated from time to time, it would be advantageous to consider the necessity of disposing of limited quantities of hazardous wastes when selecting a replacement for the Ordot landfill.

6D Territory Strategy

Figure 2-1 displays the stretegy tasks recommended for the Territory of Guam. Each task is discussed below.

6D.1 Consider Need to Dispose of Limited Quantities of Hazardous Wastes

Because a limited quantity of hazardous wastes are generated from time to time, it is recommended this be given consideration when selecting a replacement for the Ordot landfill. In addition, those suspended and unusable pesticides and miscellaneous chemical compounds currently held by government agencies should be shipped off island for disposal at an existing hazardous waste landfill. Continued storage is regarded as a significant potential hazard. Private firms should be encouraged to do the same.

6D.2 Encourage Waste Oil Reprocessing/Reuse

GORCO and Guam Power Authority should be encouraged to reprocess/reuse waste lubricating oil. It is recommended the Guam Environmental Protection Agency develop and establish the feasibility of waste oil collection and reuse programs. Road dusting and landfilling of waste oil should be prohibited.

6D.3 Submit Request for Fiscal Year 1979 Funding

Request to EPA for Fiscal Year 1979 funding must be included in the June draft of the 1978 work plan submittal. The work plan is the Fiscal Year 1979 activities plan. Final draft is due August 1978.

6D.4 Administration of Hazardous Waste Management Program

If it is determined the Territory's best interest is served by local program administration in lieu of the Federal program promulgated by PL94-580, the following steps should be taken:

6D.4.1 Prepare to Apply for Interim Authority

These steps must be completed before application for interim authority to administer the Territory hazardous waste program can be submitted:

- Enactment of legislation providing authority to control on-site and off-site disposal (PL14-37 should suffice).

- Identification of adequate resources (funding, manpower, etc.) to implement interim program.

- Development of a permit system for storage, treatment, and disposal operations.

- Development of a surveillance plan and designation of a surveillance agency.

- Development of an authorization plan to bring interim program up to standards of fully authorized program by October 20, 1980 (refer to Task 5 for requirements of a fully authorized plan).

6D.4.2 Apply for Interim Authority

Applications for temporary authorization to carry out the hazardous waste management program should be submitted to the Region IX Administrator between July 20 and October 20, 1978. By the time of application, the proposed interim program must be in existence.

6D.4.3 Administer Interim Hazardous Waste Program

If authorization is granted, Guam will be entitled to carry out the program in lieu of the Federal program for a twenty-four month period beginning October 20, 1978.

6D.4.4 Apply for Full Authority

EPA will have six months from date of submission to evaluate Guam's application for full authority. The application therefore must be submitted by April 20, 1980 to allow sufficient time for review before interim authorization terminates.

6D.4.5 Administer Full Hazardous Waste Program

If authorized, administration of full program would begin October 1980.

6E Establish Manpower Requirements

The manpower required to implement tasks proposed in Section 6D is as follows:

Fiscal Year 1978 (Man-Years)

• Encourage waste oil utilization	0.05 MY
• Prepare and submit request for Fiscal Year 1979 funding (hazardous waste portion only)	0.01 MY
• Prepare and apply for interim authority to administer hazardous waste program	0.25 MY
• Consider need to dispose of limited quantity of hazardous wastes	0.01 MY
Fiscal Year 1978	0.32 MY

Fiscal Year 1979 (Man-Years)

• Continue to encourage waste oil utilization	0.05 MY
• Prepare and submit request for Fiscal Year 1980 funding	0.01 MY
• Administer interim hazardous waste program	0.54 MY
• Prepare for full authority	0.40 MY
Fiscal Year 1979	1.00 MY

Fiscal Year 1980 (Man-Years)

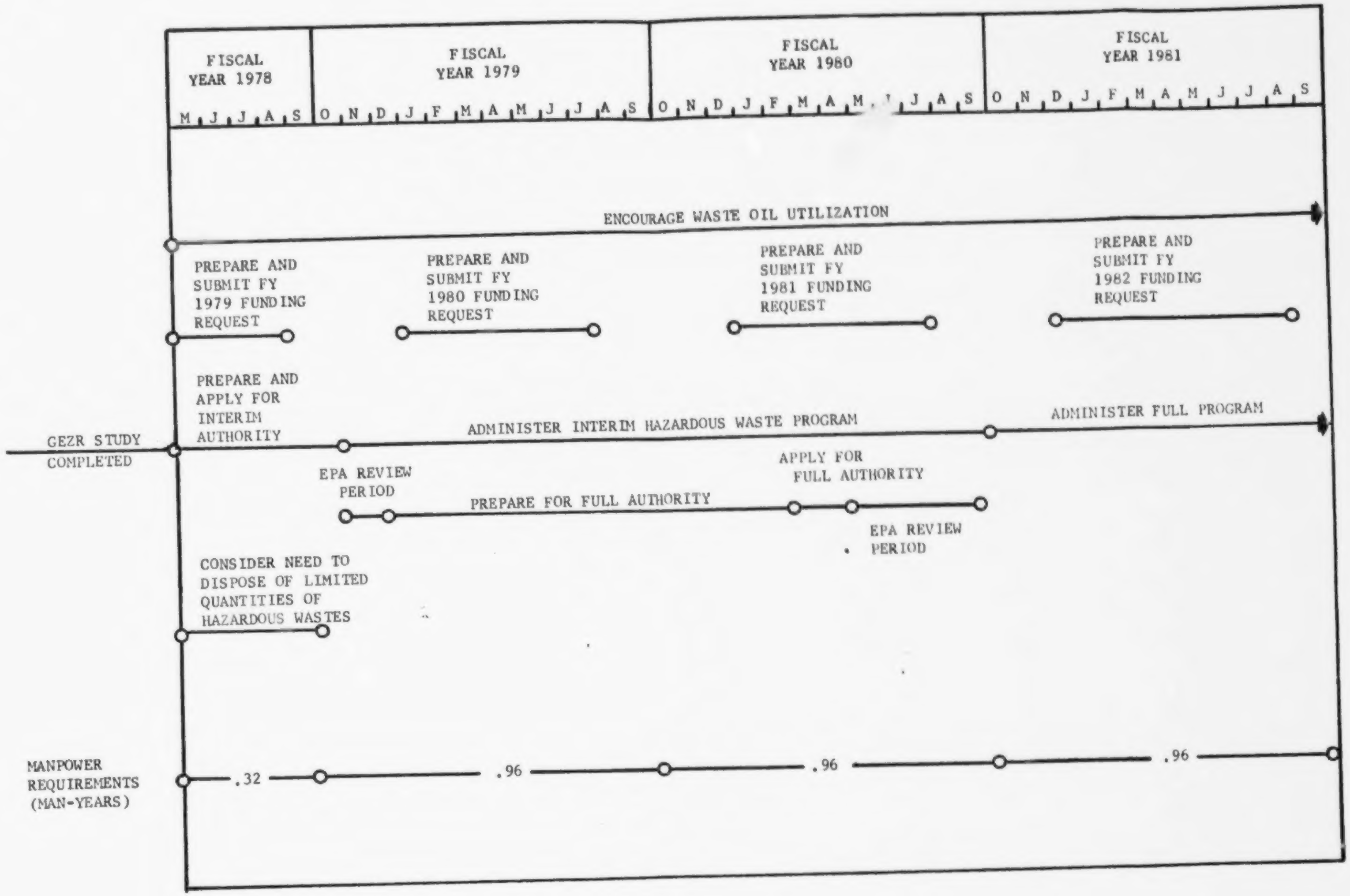
• Continue to encourage waste oil utilization	0.05 MY
• Prepare and submit request for Fiscal Year 1981 funding	0.01 MY
• Administer interim hazardous waste program	0.54 MY
• Prepare and apply for full administrative authority	0.40 MY
Fiscal Year 1980	1.00 MY

Fiscal Year 1981 (Man-Years)

• Continue to encourage waste oil utilization	0.05 MY
• Prepare and submit request for Fiscal Year 1982 funding	0.01 MY
• Administer full hazardous waste program	0.94 MY
Fiscal Year 1981	1.00 MY

The office best suited for administering and conducting such tasks is the Guam Environmental Protection Agency.

FIGURE 2-1 SCHEDULE OF STRATEGY TASKS



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TRUST TERRITORY ISLANDS

HAZARDOUS WASTE MANAGEMENT

PROBLEM ASSESSMENT AND STRATEGY FORMULATION

chapter one: *state of hawaii*
chapter two: *territory of guam*
chapter three: ***territory of american samoa***
chapter four: *government of northern marianas islands*
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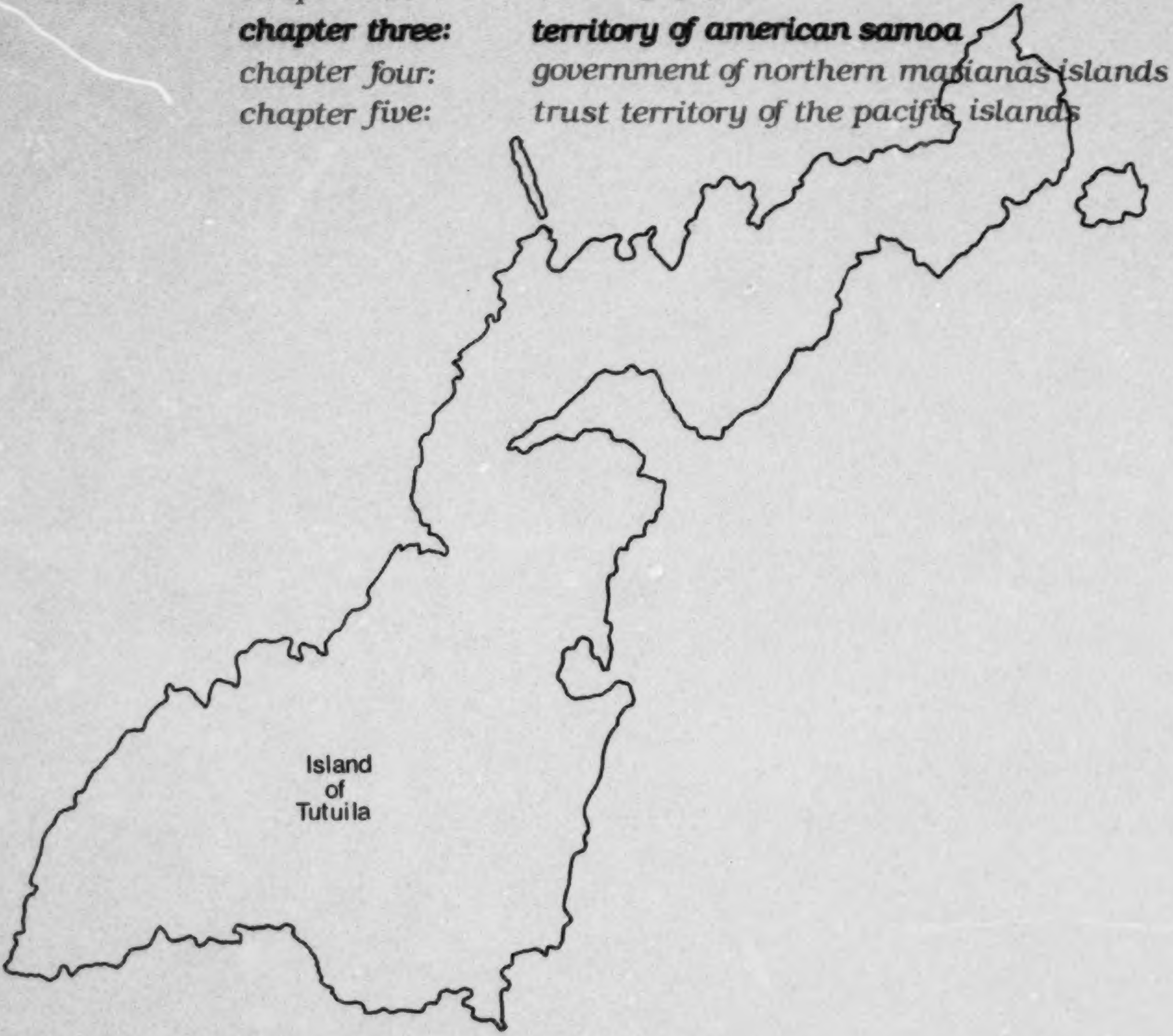

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INTRODUCTION

Background

American Samoa is a territorial possession of the United States under Department of the Interior jurisdiction. The seven islands of American Samoa are the only United States soil south of the equator. They lie about 3,830 kilometers (2,300 miles) southwest of Hawaii and about 2,670 kilometers (1,600 miles) northwest of New Zealand. The main island of Tutuila, population 30,000, runs east and west and has a jungle covered mountain range extending its full length. It is almost bisected by Pago Pago Harbor, which is recognized as one of the most natural and best protected harbors in the Pacific. Pago Pago usually receives about 500 centimeters (200 inches) of rain a year, with most of it falling from December to March. The average temperature range is between 21°C and 32°C (70°F and 90°F), and the humidity averages about 80 percent during most of the year. Government operations and a great portion of commercial activities are located in the harbor area. Two tuna canneries are the largest private employers. Other private economic activity includes limited tourism, some small wholesale and retail businesses, and shipping and transportation services. Government is the dominant source of capital and expenditures, and provides 40 percent of the territory's employment.

Summary of Chapter Findings and Recommendations

Hazardous waste generation and management practices were analyzed by conducting extensive field surveys of industrial and commercial enterprises and public agencies on the island of Tutuila.

TASK 1 IDENTIFICATION OF CONDITIONS

Although the hazardous wastes generated in American Samoa are limited, they pose a significant threat to a small island environment.

TASK 2 STORAGE

Hazardous wastes currently held in storage are suspended and unusable pesticides and old transformers containing PCB's.

TASK 3 PROJECTIONS

Quantities of hazardous wastes are projected to increase in the future. However, this increase is not expected to significantly change the magnitude of the problem or the management practices necessary to protect human health and the environment.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

Hazardous wastes which are currently managed in an environmentally unacceptable manner are:

- Bilge water
- Paint-contaminated blasting sand
- Spent pesticide containers
- Spent photo chemicals
- Suspended and unusable pesticides
- Tank bottom sediments
- Tetraethyl lead sludge
- Waste lubricating oil

TASK 5 LAWS AND REGULATIONS

The Resource Conservation and Recovery Act of 1976 (PL94-580) requires the Federal Environmental Protection Agency (EPA) to establish and administer a nationwide hazardous waste management program. States and territories are allowed to implement a substantially equivalent program in lieu of the Federal program. If the territory does not, the Federal program will be put into effect and enforced by the EPA, Region IX office. Additions to existing laws and regulations would need to be promulgated to fulfill requirements for territorial administration under PL94-580.

TASK 6 RECOMMENDED STRATEGY

The following recommendations provide for the proper management of hazardous wastes:

- Practices which are identified as environmentally acceptable should be continued.
- The Oil Users Committee's plan to process bilge water or a similar oily water separation system should be implemented.
- Measures should be instituted to reduce the quantities of paint-contaminated blasting sand. This waste requires disposal in a hazardous waste landfill.

- Spent pesticide containers must be triple-rinsed, punctured, and crushed, prior to burial at the Futiga landfill, in accordance with Federal EPA regulations. Unrinsed containers require disposal at a hazardous waste landfill.

- Photo developers should be encouraged to recover silver from their process waste streams. Effluents should be directed to the sewage treatment plant.

- Suspended and unusable pesticides require disposal at a hazardous waste landfill. Storage prior to disposal should be in tightly closed containers in a cool, dry, secured area, with adequate ventilation.

- Tank bottom sediments should be buried in securely fastened steel drums in a specially designated area of the Futiga landfill.

- Tetraethyl lead sludge requires disposal in a hazardous waste landfill.

- Unusable transformers filled with liquid containing PCB's require disposal at an EPA approved facility.

- Instituting waste reduction measures and arranging with bulk petroleum products suppliers to ship off island to a suitable rerefining facility is the most expedient method of properly managing waste lubricating oil. However, implementation of an alternative which permits island reuse will prove very beneficial to local economies as the cost of petroleum products increases. It is therefore recommended a detailed waste oil utilization study be conducted.

The hydrologic conditions of American Samoa preclude hazardous waste landfill siting without significant engineered features to protect ground water. The quantities requiring disposal do justify consideration of the development of a limited hazardous waste landfill for the disposal of those wastes not considered extremely hazardous. Wastes which should be considered for local hazardous waste disposal are paint-contaminated blasting sand, tank bottom sediments (excluding tetraethyl lead sludge), and any other such waste that might be generated from time to time. Otherwise, blasting sands and those extremely hazardous wastes generated will require shipment off island for proper disposal.

TASK 1 IDENTIFICATION OF CONDITIONS

1A A Review and Summation of Existing Reports on Hazardous Wastes

No previous studies dealing with hazardous waste management in American Samoa have been conducted.

1B Expected Types of Hazardous Wastes

Table 3-1 lists major types of hazardous wastes expected in American Samoa.

1C Potential Hazardous Waste Generators

Potential major hazardous waste generators in American Samoa include:

- An acetylene manufacturer
- Airport maintenance facilities
- Coast Guard
- Construction firms
- Department of Agriculture
- Department of Public Works
- Farmers
- Hospital/pharmacy
- Ship repair facilities
- Pest control firms
- Petroleum bulk storage facilities
- Photo developers
- Service stations and garages

1D Survey Methodology

Potential hazardous waste generators were surveyed by mail and/or interviewed personally during field investigations to determine types and quantities of hazardous wastes.

TABLE 3-1

EXPECTED TYPES OF HAZARDOUS WASTES

Source	Type
Agricultural	• Spent pesticide containers • Suspended and unusable pesticides
Governmental	• Digested sewage sludge • Spent chlorine/pesticide containers • Suspended and unusable pesticides • Unusable transformers (electrical substation) containing PCB fluids • Waste lubricating oils
Hospital/Pharmacy	• Expired and unusable medicines • Pathological/Infectious wastes • Spent photo chemicals
Industrial/Commercial	• Lime slurry • Paint-contaminated blasting sand • Petroleum waste products • Spent pesticide containers • Spent photo chemicals • Suspended and unusable pesticides • Unusable paints

1E Generation Rates

Table 3-2 summarizes the types and quantities of hazardous wastes reported.

TABLE 3-2 - HAZARDOUS WASTE GENERATION, AMERICAN SAMOA, 1977 (SHEET 1 OF 1)

Waste Material	Source	Annual Quantity
Digested Sewage Sludge	Wastewater Treatment Plant (Department of Public Works)	126 Metric Tons 140 English Tons
Expired and Unusable Medicines	Hospital/Pharmacy	55 Kilograms 120 Pounds
Lime Slurry (Calcium Hydroxide)	Acetylene Manufacturing	0.6 Cubic Meters 20.0 Cubic Yards
Paint-Contaminated Blasting Sand	Ship Repair Facilities (Bottom Blasting)	630 Metric Tons 700 English Tons
Pathological/Infectious Wastes (Tissues, Laboratory Wastes, Sharps, Test Animals, and Isolation Ward Wastes)	Hospital	5,000 Kilograms 11,000 Pounds
Petroleum Waste Products:		
• Absorbent Chips Contaminated With Oil	Coast Guard (Harbor Oil Spills)	1,900 Liters 500 Gallons
• Bilge Water	Tuna Fishing Fleet	76,000 Liters 20,000 Gallons
• Oily Water	Petroleum Bulk Storage Facility (Tanker Truck Flushings)	11,400 Liters 3,000 Gallons
• Tank Bottom Sediments	Petroleum Bulk Storage Facility (Tank Cleaning)	1,900 Liters 450 Gallons
• Tetraethyl Lead Sludge	Petroleum Bulk Storage Facility (Tank Cleaning)	1,100 Liters 300 Gallons
• Waste [illegible]icating Oils	• Airport Maintenance Facilities	3,800 Liters 1,000 Gallons
	• Tuna Canneries	19,000 Liters 5,000 Gallons
	• Construction Firms - Heavy Equipment	11,400 Liters 3,000 Gallons
	• Government Vehicles and Equipment (Department of Public Works)	15,200 Liters 4,000 Gallons
	• Power Generating Facilities (Department of Public Works)	114,000 Liters 30,000 Gallons
	• Private Vehicles	38,000 Liters 10,000 Gallons
	• Tuna Fleet	266,000 Liters 70,000 Gallons
	Total	467,400 Liters 123,000 Gallons
Spent Pesticide Containers (Glass, Metal, Paper, Plastic)	• Tuna Canneries	25 Items
	• Department of Agriculture	200 Items
	• Farmers	200 Items
	• Pest Control Firms	25 Items
	Total	450 Items
Spent Photo Chemicals (Black and White Developing)	• Hospital	15,200 Liters 4,000 Gallons
	• Photo Developers	30,400 Liters 8,000 Gallons
	Total	45,600 Liters 12,000 Gallons
Unusable Paints	Ship Repair Facilities	190 Liters 50 Gallons

TASK 2 STORAGE

The Department of Agriculture is currently storing 190 liters (50 gallons) of dieldrin, 3.8 liters (one gallon) of potassium cyanide, and approximately one liter (one quart) of Compound 1080. The Department has used these pesticides in the past but presently has not approved use for them. In addition, Electric Utility is storing a number of old transformers which contain an estimated 1,000 gallons of PCB liquid.

TASK 3 PROJECTIONS

Projections of hazardous waste generation are tabulated in Table 3-3. Methodology used in preparing these projections is discussed below.

3A Digested Sewage Sludge

Projections of sludge generation were made by the Department of Public Works based on anticipated service expansion and population increases.

3B Hospital/Pharmacy Wastes

It is assumed generation of these wastes will parallel population growth at two percent per year. This growth rate was derived from a straight-line extrapolation of data reported in Reference 24.

3C Industrial/Commercial Wastes

Wastes generated by the industrial and commercial sectors were projected based on information obtained from individual interviews during field investigations. Little or no increase is expected.

3D Spent Pesticide Containers

Projections for spent pesticide container generation were made by the Department of Agriculture. An approximate growth rate of one percent per annum over the next 10 years is expected.

3E Waste Lubricating Oils

Electric Utility is not planning to increase power generating capacity within the next 10 years unless there is significant development at Tafuna Industrial Park (refer to Section 3F). Increasing use of existing capacity, however, within the next 10 years will cause a corresponding increase in lubricating oil produced from the power generating facilities. Electric Utility is expecting an annual five percent increase in electrical demand. Waste oil generated from private vehicles is expected to parallel motor vehicle registration growth. Two thousand private vehicles are currently registered and a five percent annual growth rate is anticipated. The Department of Public Works does not expect an increase in the number of government vehicles.

TABLE 3-3 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, AMERICAN SAMOA, 1977 (SHEET 1 OF 1)

Hazardous Waste	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Digested Sewage Sludge (Metric/English Tons)	126	140	315	350	1,080	1,200
Expired and Unusable Medicines (Kilograms/Pounds)	55	120	60	130	70	150
Lime Slurry (Cubic Meters/Yards)	0.6	20	0.6	20	0.6	20
Paint-Contaminated Blasting Sand (Metric/English Tons)	630	700	630	700	630	700
Pathological/Infectious Wastes (Kilograms/Pounds)	5,000	11,000	5,500	12,100	6,100	13,400
Petroleum Waste Products (Liters/Gallons)	467,400	123,000	486,100	127,900	505,500	133,000
Spent Pesticide Containers (Items)	450 Items		470 Items		500 Items	
Spent Photo Chemicals (Liters/Gallons)	46,600	12,000	47,500	12,500	49,400	13,000
Unusable Paints (Liters/Gallons)	190	50	190	50	190	50

3F Tafuna Industrial Park

The government of American Samoa would like to develop Tafuna Industrial Park as its future industrial base. According to the Office of Economic Development and Planning, the government is researching the following types of operations:

- Clothing (cutting and sewing)
- Electronics (assembly only)
- Food processing and canning

Facilities for a water tank cleaning and reclamation operation are currently under construction. It is unlikely operations as described by the Office of Economic Development and Planning will generate hazardous wastes.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

4A Identified Haulers and Storage, Processing, and Disposal Site Operators

There are no commercial hazardous waste haulers or processors on American Samoa. Most wastes are stored or disposed on-site, or transported to the Futiga landfill by the generator. An acetylene manufacturer is utilizing property leased by the canneries to dispose of lime slurry. The petroleum bulk storage facility operator is using airport tank farm grounds to dispose of tank sludges.

4B Establish Criteria

Criteria for minimum acceptable standards for certain hazardous waste management practices appear in Appendix B.

4C Investigation of Identified Operations

Field investigations of storage and disposal operations were undertaken in January 1978. Descriptions and evaluation of hazardous waste management practices are presented in the following section.

4D Evaluation of Practices

Evaluations of identified hazardous waste management practices according to criteria developed in Appendix B are summarized in Table 3-4.

4D.1 Digested Sewage Sludge

Only one of the primary wastewater treatment plants on Tutuila is operational. Digested sludge from this plant is landfilled. Plans for future sludge generation from both facilities call for storage in drying beds prior to use as a soil conditioner or landfill disposal. Since no industries discharge wastewater contaminated with heavy metals, these practices are deemed environmentally acceptable. Soil conditioning with sludge should be encouraged. Chlorine containers are returned to the supply office for refill.

4D.2 Expired and Unusable Medicines

Most expired and unusable medicines from the hospital and pharmacy are returned to the manufacturer for credit. The remaining quantity is shipped to the U. S. Drug Enforcement Administration or flushed to the sewer system. These practices are considered environmentally acceptable.

TABLE 3-4 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, AMERICAN SAMOA, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Digested Sewage Sludge	None	Truck (Yes)	None	Landfill (Yes)
Expired and Unusable Medicines	Original Containers (Yes)	None	None	Returned to Manufacturer (Yes); Sewer System (Yes); Shipped to Drug Enforcement & Narcotics Administration (Mainland U. S.) (Yes)
Lime Slurry	Drying Ponds (Yes)	Truck (Yes)	Solar Evaporation (Yes)	Codisposed With Tuna Cannery Sludge (Yes)
Paint-Contaminated Blasting Sand	None	Truck (Yes)	None	Disposal on Private Land (No); Landfill (No)
Pathological/Infectious Wastes	Plastic Bags (Yes)	Hand/Truck (Yes)	Autoclaving (Yes); Incineration (Yes); Needle Destruction (Yes)	Landfill for Autoclaved Waste (Yes); Incineration (Yes); Sewer System (Yes)
Petroleum Waste Products:				
• Absorbent Chips Contaminated With Oil	None	Truck (Yes)	None	Landfill (Yes)*
• Bilge Water	None	None	None	Disposed to Navigable Waters (No)
• Oily Water	Drums (Yes)	Tanker Truck (Yes)	None	Airport Fire Department (Fire Drills) (Yes)
• Tank Bottom Sediments/ Tetraethyl Lead Sludge	Drums (Yes)	Truck (Yes)	None	Mixed With Cinders on Airport Tank Farm Grounds (No)
• Waste Lubrication Oils	Drums/Tanks (Yes)	Truck (Yes)	None	Ocean Dumping, 57% (No); Road Dusting, 30% (No) Landfill, 12% (No); Fire Department, 1% (Yes)
Spent Pesticide Containers	None	None	Rinsing or Puncturing Only (No)	On-Site Burial or Burning (No); Landfill (Yes); Reuse as Refuse Containers (No)
Spent Photo Chemicals	Process Tanks (Yes)	None	None	Sewer System (Yes)*; Storm Drain (No)
Unusable Paints	Original Containers (Yes)	Truck (Yes)	None	Landfill (Yes)**
Suspended and Unusable Pesticides	Unlocked Storehouse (No); Locked Storehouse (Yes)	N/A	N/A	N/A

* Acceptable for small quantities.
** Acceptable for water base paints containing no toxic pigments only.

4D.3 Lime Slurry

Lime slurry (calcium hydroxide) is generated during acetylene production. This waste is corrosive but non-toxic. The slurry generated is dried by ponding prior to mixing with tuna cannery waste in sludge ponds at a private site leased by the canneries. The lime cake, which is basic in nature, tends to neutralize the slightly acidic tuna wastes. This practice is considered environmentally acceptable. Other possible lime cake uses include mixing with acidic soils or use at the wastewater treatment plants for digester pH control.

4D.4 Paint-Contaminated Blasting Sand

Marine Railway, a government enterprise, maintains and repairs the large tuna fleet supplying the canneries. During hull and bottom blasting operations, paint chips contaminate the blasting sand. Paints normally used to coat ship bottoms contain oxides of calcium, cobalt, copper, lead, magnesium, tin, and/or zinc (Reference 9) to retard plant and organism growth. Paint-contaminated blasting sand from an operation in California was tested for its leaching potential by the State Department of Health (Reference 15). Concentrations of copper, lead, and tin exceeded acceptable water quality standards. Disposing of this waste on private land or at the landfill is therefore environmentally unacceptable due to the potential contamination of surface waters or ground water reserves.

4D.5 Pathological/Infectious Wastes

Tissues, sharps, and isolation ward wastes are incinerated at the hospital. The incinerator (Metz Engineering Company Model APA402) provides adequate high temperatures and residence times to insure sterilization. Bacteriological cultures are autoclaved prior to being bagged, and disposed of at the landfill. Liquid wastes are sewered. These practices are environmentally acceptable.

4D.6 Petroleum Waste Products

The Coast Guard cleans up harbor oil spills with absorbent chips. These chips, once used, are disposed of at the landfill. This practice is environmentally acceptable for small quantities.

The tuna fleet discharges their bilge water to the ocean. While this practice is not illegal, it is not considered environmentally sound. It is also suspected the fleet may be dumping lubricating oil at sea, which is illegal under the Federal Water Pollution Control Act.

The petroleum bulk storage facilities on Tutuila are in the Pago Pago harbor area and at the airport. Tank sludges (a mixture of rust, oil, sand, dirt, and water) generated every year during tank maintenance are hauled to the airport tank farm where the sludges are mixed with cinders during burial. This practice is considered environmentally unacceptable due to the potential for ground and surface water contamination. Oily water from tanker truck flushings is given to the Airport Fire Department for use during fire drills. This practice is acceptable if local air pollution control standards are not exceeded.

Waste lubrication oil generated by Department of Public Works activities is used by the Construction Branch to dust roads or to coat equipment to prevent corrosion. Private construction companies also dust roads with waste oils. While road dusting is a common practice throughout the United States, it is not the optimum use of waste oil. Disposal of waste oils in this manner creates the potential for ground and surface water contamination, primarily due to the heavy metal additives in most lubricating oils. This practice is therefore considered environmentally unacceptable. Waste oils from airport equipment maintenance is utilized by Airport Fire Department for fire drill practice. Waste oil from other sources is landfilled. This is environmentally unacceptable.

4D.7 Spent Pesticide Containers

The Department of Agriculture and local farmers burn or bury spent pesticide containers on-site. Non-organic containers are punctured prior to burial. Lack of control over on-site burning and burial practices makes burning and on-site burial environmentally unacceptable.

Canneries generate approximately 25 spent containers annually (55-gallon metal drums). One cannery is rinsing and puncturing their drums, then using them as trash containers. The other cannery is permitting employees to take drums home without prior treatment. Potential hazard to human health dictates these containers be reused only for their original purpose.

Pest control firms dispose of spent containers at the landfill after rinsing. Landfilling is an environmentally acceptable practice if containers are properly triple-rinsed, punctured, and crushed prior to disposal.

4D.8 Spent Photo Chemicals

Spent photo chemicals are generated at the hospital's X-ray laboratories and the local photo developing shop. No color processing occurs. The hospital disposes of spent photo chemicals to the sewer system. Silver recovery does not occur, but plans have been formulated to purchase a $950 electrolysis unit. Spent photo chemicals from the local photo developer are discharged to a storm drain. While sewer disposal of small quantities of diluted black and white processing wastes is considered environmentally acceptable; storm drain disposal is not.

4D.9 Suspended and Unusable Pesticides

Dieldrin was reported stored in an unlocked storehouse. This is unacceptable. The remaining pesticides were reported being stored in a locked storehouse.

4D.10 Unusable Paints

Unusable paints generated by Marine Railway are disposed of at the landfill. This practice is considered environmentally unacceptable for oil base paints containing heavy metals, and/or toxic and flammable solvents, and water base paints containing toxic pigments.

TASK 5 LAWS AND REGULATIONS

5A A Review of Existing Laws, Regulations, Ordinances Dealing With Hazardous Wastes

Federal statutes affecting management of hazardous wastes are summarized in Table 3-5 and described in Appendix C. Territorial statutes affecting hazardous waste management are described briefly in the following sections.

5A.1 Territory Statutes

5A.1.1 Title 13 - Conservation, Chapter 1 - Environmental Quality Act

This act is designed to achieve and maintain levels of air and water quality that will protect human health and safety, and prevent injury to plant and animal life and property. The act establishes an Environmental Quality Commission and confers upon it the authority to adopt regulations implementing this chapter.

5A.1.2 Title 20 - Harbors and Navigations, Chapter 13 - Health and Safety

Section 1411 prohibits the discharge of refuse, sludge, acid, or any other matter of any kind into any harbor or stream flowing into the harbor.

Section 1412 prohibits the discharge to any harbor of oil sludge, waste oil, fuel oil, bilge water, or any other waste which may cause contamination of harbor waters.

5A.2 Territory Regulations

No Territory regulations have been promulgated dealing with hazardous waste management.

5B A Guide for a Hazardous Waste Management Program (Reference 17)

As discussed in Appendix C, the Resource Conservation and Recovery Act of 1976 (PL94-580), Sections 3001 through 3010, requires the Federal EPA to establish standards and promulgate regulations for the proper management of hazardous wastes. States and territories are allowed to develop and administer a substantially equivalent program in lieu of the Federal program. Grant money has been appropriated for two years to finance up to 75 percent of the program. At this time it is undetermined whether financing will be continued. If the state or territory does not elect to administer a program, the Federal program will be put into effect and enforced by the appropriate regional EPA office.

TABLE 3-5

FEDERAL STATUTES DEALING WITH HAZARDOUS WASTE MANAGEMENT

Statute/ Administering Agency	Description
Resource Conservation and Recovery Act of 1976 (PL94-580)/Environmental Protection Agency	Places primary responsibility to regulate management of hazardous wastes on EPA.
Toxic Substances Control Act of 1976 (PL94-469)/EPA	Authorizes research and regulation of those substances found to be hazardous.
Section 112 of the Clean Air Act Amendments of 1970 (PL91/604)/EPA	Authorizes the setting of standards for hazardous air pollutants and controls the incineration of hazardous wastes.
Federal Water Pollution Control Act Amendments of 1972 (PL92-500)/ EPA	Authorizes control over toxic pollutants discharged into water from point sources, the removal of toxic pollutants from critical port and harbor areas, and a plan describing the process for the disposal of pollutants.
National Environmental Policy Act of 1969 (NEPA) (PL91-190)/Not Specified	Requires the preparation of an Environmental Impact Statement for all Federal hazardous waste management activities.
The Occupational Safety and Health Act of 1970 (OSHA) (PL91-596)/ Department of Labor	Authorizes the setting of mandatory standards to protect people working with hazardous materials.
The Poison Prevention Packaging Act of 1970 (PL91-601)/Department of Health, Education, and Welfare	Authorizes the establishment of special packaging standards for hazardous household substances.
The Federal Hazardous Substances Labelling Act of 1960 (PL86-613)/ Department of Transportation (DOT)	Prohibits the transport of hazardous substances that have been misbranded or the labels have been removed.
Hazardous Materials Control Act of 1970 (PL91-458)/DOT	Authorizes an evaluation of the hazards associated with transporting hazardous materials.

* Reference 16.

TABLE 3-5 - (Continued)

Statute/ Administering Agency	Description
Transportation of Explosives Act (U. S. Code, Title 18, Chapter 39)/ DOT	Prohibits the unregulated transport of dangerous materials.
The Safety Regulation of Civil Aeronautic Act of 1958 (PL85-726)/Federal Aviation Administration of DOT	Authorizes FAA to develop air transportation standards to provide adequate safety.
The Hazardous Cargo Act (U. S. Code, Title 46, Chapter 7)/U. S. Coast Guard	Places controls on the water transport of dangerous substances
The Food, Drug, and Cosmetic Act Animal Drug Amendments of 1968 (PL90-399)/Not Specified	Prohibits the misbranding of certain consumer items.
The Marine Protection Research and Sanctuaries Act of 1972 (PL92-532)/ EPA	Prohibits the transport for ocean dumping of many extremely hazardous wastes.
The Coastal Zone Management Act of 1972 (PL92-583)/Not Specified	Requires that coastal management agencies regulate hazardous waste disposal.
Section 212 of the Resource Recovery Act of 1970 (PL91-512)/EPA	Requests a study of the feasibility of a system of national hazardous waste disposal sites.
Safe Drinking Water Act of 1974 (PL93-523)/EPA	Authorizes regulation of underground injection of toxic wastes.
The Atomic Energy Act of 1954, as Amended (PL83-703)/NRC and Private Industry	Authorizes the management of radioactive wastes generated in fission reactions.
The Armed Forces Appropriation Authorization Acts of 1969 and 1979 (PL91-121; PL91-441)/Not Specified	Limits the use of Federal funds for disposal of chemical and biological warfare agents.
The Federal Environmental Pesticide Control Act of 1972 (PL92-516)/EPA	Requires the establishment of procedures and regulations for the disposal of pesticides.

There are several important advantages to local control of the program. These include:

(1) The program can be tailored to meet local conditions. The current EPA draft regulations appear to be aimed at the highly industrialized areas of the United States, and are in part inappropriate to the hazardous waste problems unique to the islands in the Pacific Basin.

(2) Coordination with other territorial programs in air, water, and solid waste is simplified.

(3) Better public relations are promoted.

(4) Communications between American Samoa and EPA Region IX (San Francisco) are difficult and expensive. This will place a significant burden on industry, environmentalists, and others in representing their interests, receiving technical guidance, appealing decisions, etc.

(5) Compliance and enforcement procedures are direct.

Section 3006 of this law allows for the territory to apply for interim authority to conduct the program. It allows the territory two years to comply with all requirements for full authorization, while offering immediate eligibility for grant funding. Requirements for partial authorization are as follows:

- Establishment of legislative authority to control on-site and off-site disposal of hazardous wastes.
- Identification of resources (manpower, matching funds, etc.) to conduct the program.
- Development of a permit system for storage, treatment, and disposal of hazardous wastes substantially equivalent to the Federal system.
- Establishment of surveillance and enforcement procedures.
- Development of a plan to bring all elements of the program into compliance with requirements for full authorization by October 21, 1980.

Application should be made to the Administrator of EPA Region IX between July 20 and October 20, 1978.

The following is a guideline for the development of a hazardous waste management program consistent with current draft (January 1978) EPA regulations promulgated under PL94-580. Table 3-6 displays existing laws anticipated to satisfy guideline requirements and suggests appropriate actions necessary to establish a program substantially equivalent to the Federal program.

TABLE 3-6 - RECOMMENDED REGULATORY ACTION, AMERICAN SAMOA, 1977 (SHEET 1 OF 1)

Program Guideline	Existing Law/Regulation/Ordinance	Recommended Action
Legislative Authority*	Title 13, Chapter 1	None
Hazardous Waste Criteria	--	**
Standards Applicable to Generators		
• Record-keeping	--	**
• Labelling	--	**
• Containerization	--	**
• Information provided to transporters	--	**
• Manifest system	--	**
• Report submission	--	**
Standards Applicable to Transporters		
• Record-keeping	--	**
• Transporting properly labelled waste only	--	**
• Manifest system	--	**
• Transporting waste to permitted facilities	--	**
• Coordination with regulations of Department of Transportation	--	**
Standards Applicable to Owners/Operators of Waste Treatment, Storage, and Disposal Facilities		
• Record-keeping	--	**
• Reports	--	**
• Standards for design, operation, and construction of facilities	--	**
• Location of facilities	--	**
• Facility monitoring and inspection	--	**
• Contingency plans	--	**
• Training of facility personnel	--	**
• Maintenance of facilities	--	**
• Ownership, continuity of operations, and financial responsibility	--	**
• Performance standards necessary to protect the environment and human health	--	**
Permits for Treatment, Storage, or Disposal of Hazardous Waste*		
• Content of application	--	**
• Issuance procedure	--	**
• Time limitation to bring facility into compliance	--	**
• Permit revocation procedure	--	**
Preliminary Notification		
• Require notification by handlers of identified hazardous wastes	--	**
Enforcement Provisions*		
• Enforcement staff and funding	--	**
• Authority to inspect facilities, copy records, and obtain samples	--	**
• Delineation of agency responsibility	--	**
Compliance Provisions*		
• Procedures for informing violators	--	**
• Civil and criminal penalties	--	**

* Required for interim authorization.

** Adopt regulations which meet EPA hazardous waste standards and requirements to be promulgated under PL94-580.

5B.1 Legislative Authority to Establish Standards for Hazardous Waste Management

5B.2 Hazardous Waste Criteria

- Establishment of criteria for the identification of hazardous waste (toxicity, persistence, flammability, corrosiveness, infectiousness, reactiveness, radioactivity).
- Establishment of a list of particular wastes subject to regulation.

5B.3 Issuance of Standards Applicable to Generators of Hazardous Wastes

- Record-keeping practices accurately identifying quantity, composition, and disposition of hazardous wastes generated.
- Labelling practices for containers of hazardous waste.
- Containerization per U. S. Department of Transportation (DOT) requirements.
- Furnishing of information on general chemical composition of hazardous waste to persons transporting, treating, storing, or disposing of the wastes.
- Use of a manifest system to assure all hazardous wastes generated are designated for treatment, storage, or disposal at facilities for which permits have been obtained.
- Submission of reports to a responsible agency setting out quantities generated and disposition means.

5B.4 Issuance of Standards Applicable to Transporters of Hazardous Waste

- Record-keeping concerning hazardous wastes transported, including source and delivery points.
- Transportation of hazardous waste only if properly labelled and containerized.
- Compliance with the manifest system.
- Transportation of hazardous waste only to permitted facilities.
- Coordination with DOT regulations.

5B.5 Issuance of Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- Record-keeping of hazardous wastes accepted and manner in which wastes were treated, stored, or disposed.
- Submission of reports regarding manifest violations, accidents, operating conditions, and monitoring.
- Treatment, storage, or disposal of hazardous wastes received pursuant to approved procedures.
- Location, design, and construction of hazardous waste treatment, disposal, or storage facilities.
- Monitoring of air and ground water/leachate and regular inspection of facility operations.
- Contingency plans for effective action to minimize unanticipated damage from any treatment, storage, or disposal of any hazardous waste.
- Training of all facility personnel which is approved by the permitting agency.
- Maintenance of facility.
- Ownership, continuity of operations, and the financial capability to cover possible accidents and closure costs.
- Performance necessary to protect the environment and human health.
- Landfills must be underlined with four feet of soil having a minimum permeability of 10^{-8} centimeters per second or be constructed with an equivalent mechanically designed system (use of impervious liners) for leachate collection.
- Incinerators must achieve 99 percent combustion efficiency and operate above 1,000°C (1,832°F) for two seconds, or equivalent.

5B.6 Permits for Treatment, Storage, or Disposal of Hazardous Waste

- Require each owner or operator to submit specified information in the permit application to ensure permitting agency can make the most efficient and expedient determination possible.
- Mandate time limits for application submission and review process within which both permitting agency and applicant or permittee must act.

- Require a compliance schedule to bring existing facilities into compliance with the act.

- Establish revocation procedures and circumstances.

5B.7 Preliminary Notification

Require notification by hazardous waste handlers within 90 days of promulgations of regulations.

5B.8 Enforcement Provisions

- Establishment of enforcement staff and adequate budget allocations to carry out program.

- Establishment of authority to inspect facilities, copy records, and obtain samples.

- Delineation of agency responsibilities.

5B.9 Compliance Provisions

- Establishment of procedures for informing violators.

- Establishment of civil and criminal penalties for noncompliance.

TASK 6 RECOMMENDED STRATEGY

6A Alternatives to Environmentally Unacceptable Practices

Waste handling and disposal practices identified in Task 4D as environmentally unacceptable are presented in Table 3-7.

6B Evaluation of Alternatives

Alternatives presented in Table 3-7 are evaluated in the following sections.

6B.1 Paint-Contaminated Blasting Sand

Paint-contaminated blasting sand requires disposal at a hazardous waste landfill to insure adequate environmental protection. Shipping and disposal cost in California will be a tremendous economical burden on Marine Railway (approximately $124,000 per year at 700 tons; refer to Appendix D). Efforts should concentrate on reducing quantities of waste generated.

The blasting sand used at Marine Railway does not lend itself to recycling. The particle size becomes too small after initial use to be effective for second application. There are, however, other more expensive blasting sands on the market (e.g., copper slag types) which permit a nine-fold reduction in contaminated sand generation and provide the added benefit of generating 80 percent less dust. The nine-fold reduction is attributed to the ability of the sand to be applied three times and to cover three times the square footage surface space per pound of sand. While these sands are initially more expensive, the reuse potential and increased coverage more than offset the increased price. Recycling requires filtering equipment costing approximately $20,000. Shipping and disposal cost savings of $110,000 per year arising from shipping only one-ninth of the sand currently generated more than offsets this capital cost.

Beside filtration system capital cost, a containment boom and stripping pump (approximately $4,000) should be purchased for the working channel to prevent harbor contamination from floating paint particles.

TABLE 3-7 - ALTERNATIVES TO PRESENT ENVIRONMENTALLY UNACCEPTABLE PRACTICES

AMERICAN SAMOA, 1977 (SHEET 1 OF 1)

Hazardous Waste	Storage	Transport	Recovery/ Reuse	Treatment	Disposal Point
Paint Contaminated Blasting Sand	Steel drums	--	Reuse	Filtration	Hazardous waste landfill
Petroleum Waste Products:					
• Bilge Water	Tanks	--	Reuse as a lube oil or recovery via supplemental fuel use	Oil separation; centrifugation	Effluent to harbor;* refer to Waste Lubrication Oil for disposal points for the separated oil
• Tank Bottom Sediment	Steel drums	--	--	--	Futiga Landfill
• Tetraethyl Lead Sludge	Steel drums	--	--	--	Hazardous waste landfill
Waste Lubrication Oil	Drums/tanks	--	Reuse as a lube oil or recovery via supplemental fuel use	Centrifugation	Lube oil supplier (Standard Oil); lube oil market; supplemental fuel oil market (tuna canneries, cargo ships); shipment to New Zealand for rerefining
Spent Pesticide Containers	Secured area/ protected from weather	--	--	Triple-rinsed/ punctured/ crushed	Futiga Landfill
Spent Photo Chemicals	--	--	Encourage silver recovery	Electrolysis	Sewer system
Suspended or Unusable Pesticides	Locked storehouse within secured area	DOT regulations**	Remanufacture	--	Ship to Manufacturer; hazardous waste landfill
Unusable Paints	--	DOT regulations**	--	--	Hazardous waste landfill***

* Quality of effluent must meet EPA standards for harbor disposal.

** U. S. Department of Transportation.

*** For oil-base paints containing heavy metals and/or toxic or flammable solvents or water-base paints containing toxic pigments.

6B.2 Petroleum Waste Products

6B.2.1 Bilge Water

An Oil Users Committee under Coast Guard direction is investigating a mechanism permitting the tuna fleet to empty their bilges at the tuna canneries. Under the current plan, a docking facility capable of accepting bilge water would be constructed. The bilge water would be processed through an oil separation unit. The unit under consideration is owned by Marine Railway and is presently unused. Effluent from the separation unit would be discharged to the harbor. No plans have yet been formulated on disposal means for recovered oil. Refer to Section 6B.2.4 for discussion of disposal alternatives.

6B.2.2 Tank Bottom Sediments

Tank bottom sediments disposal should be limited to the Futiga landfill to reduce disposal areas on the island. The sludge should be disposed in securely fastened steel drums, placed in a special pit, and covered. The pit area should be well marked and properly recorded on landfill site plans.

6B.2.3 Tetraethyl Lead Sludge

Tetraethyl lead sludge requires disposal in a hazardous waste landfill because of its toxic organic lead content. The cost of shipping to California and disposition of the 1,100 liters (300 gallons) generated each year is approximately $300 (refer to Appendix D for shipping and disposal costs).

6B.2.4 Waste Lubrication Oil

Waste lubricating oil, particularly troublesome in an island environment, is reclaimable. Recovery should be given highest priority. It can be rerefined for reuse as a lubricant or utilized as a supplemental fuel oil. Reuse alternatives which are potentially feasible include:

- Installation of centrifuges at all power plants to reduce waste quantities.
- Arrangements with oil suppliers to return lubricating oil to the manufacturer for reprocessing.
- Shipment to New Zealand for rerefining.
- Sale to tuna canneries as a supplemental boiler fuel.
- Use as a diesel fuel supplement at the power plant or in heavy construction equipment.

While detailed engineering studies are required to determine the optimum strategy, the first two alternatives implemented simultaneously appears to be the most cost-effective and requires minimal effort on the part of local waste oil generators.

Centrifuges remove solids and water contaminants accumulating over time and permit oil to be used 10 to 50 times longer, depending on site-specific conditions. The waste oil generated by Electric Utility's harbor facility is already being centrifuged. While the waste oil at the Futiga facility does not receive centrifuging, units are planned.

Arrangements with petroleum product suppliers (e.g., Standard Oil and Union 76) for waste oil shipment off island to suitable rerefining facilities for recovery would relieve American Samoa in the short term of this potentially environmental degrading waste. Shipments of lubrication oils to the islands are made in drums. Little expense would be incurred by the local bulk supplier to replace arriving drums with drums filled with waste oil. (For every two drums arriving it is estimated only one will require return shipment; Reference 6.) Local generators would be responsible for arranging with the local supplier to transport their waste oil back to the bulk distribution plant. Union 76 is providing such a service for its customers. However, Union 76 is transporting the waste oil to the Futiga landfill for disposal instead of shipping to a rerefining facility. In the long term, implementation of an alternative which permits island use of waste oil will prove very beneficial to local economies as the cost of petroleum products increases.

6B.3 Spent Pesticide Containers

All spent pesticide containers must be triple-rinsed, punctured, and crushed prior to burial, in accordance with Federal EPA regulations. To reduce pesticide container disposal sites, and to control disposal operation and location, disposal should be limited to the Futiga landfill. If spent containers are stored prior to disposal, storage should be in a secured area, protected from the weather.

6B.4 Spent Photo Chemicals

The discharge from the local photo developer should be routed to a wastewater treatment plant through a sewer connection. The developer should be encouraged to recover silver from process waste streams.

6B.5 Suspended or Unusable Pesticides

Dieldrin and Compound 1080 are pesticides which are restricted in use. Dieldrin can be used to control subterranean termites and 1080 can be used to control rats. However, if these pesticides are to be used in this manner their containers must be properly identified with an EPA label. Potassium cyanide is completely suspended. If dieldrin and 1080 cannot be used on-island, shipment off island will be required.

The acceptable disposal alternatives are:

- Shipment back to manufacturer for credit or remanufacturing
- Shipment to a California hazardous waste disposal facility

If possible, pesticides should be returned to the manufacturer for credit or remanufacturing. If not, they should be shipped to California for disposal. Cost of shipping and disposing of 52 gallons of pesticides would be approximately $115 (refer to Appendix D for transportation and disposal costs). Pesticide shipment requires containerization in accordance with Department of Transportation (DOT) regulations (49CFR 100-189) or the National Motor Freight Classification when DOT regulations do not apply.

While awaiting disposal, these pesticides should be stored in a locked storehouse within a secured area.

6B.6 Unusable Paints

Unusable oil-base paints containing heavy metals and/or toxic or flammable solvents and water-base paints containing toxic pigments require disposal at a hazardous waste landfill. Shipment and disposal in California would cost approximately $115 for a 190 liter (50 gallon) lot shipment (one year's generation). These paints must be containerized in accordance with DOT regulations.

6B.7 Unusable Transformer Containing PCB Fluid

The transformer, because it contains PCB fluid, requires disposal at an EPA approved disposal facility. Disposal in California is recommended. The California State Department of Health is interested in accepting the transformer fluid in California for a test at a new liquid waste incinerator. If this can be arranged, disposal cost of the transformer might be reduced.

6C Identification of Potential Sites for Hazardous Waste Disposal

The hydrogeologic conditions of American Samoa preclude hazardous waste landfill siting without significant engineered features to protect ground water. The quantities requiring disposal do justify considering development of a limited hazardous waste landfill for the disposal of those wastes not deemed extremely hazardous. Wastes which should be considered for local hazardous waste disposal are paint-contaminated blasting sand, tank bottom sediments (excluding tetraethyl lead sludges) and any other such wastes which might be generated from time to time. Otherwise, blasting sands and those extremely hazardous wastes generated will require shipment off island for proper disposal.

6D Territory Strategy

Figure 3-1 displays the recommended hazardous waste management strategy for American Samoa. Each item is discussed below.

6D.1 Disposal of Unusable Pesticides and Transformers Held in Government Storage

Unusable pesticides held in government storage should be collected and shipped to California for disposal if they cannot be returned to the manufacturer for credit. Continued storage of these pesticides is regarded as a significant potential hazard. Similarly, the transformers filled with PCB-containing liquid should be shipped off island to an EPA approved disposal site.

6D.2 Investigate Waste Oil Utilization

The recommendation of Section 6B.2.4 provides the most expedient method of recovering waste oil (i.e., volume reduction and shipment of the remainder off island via lubrication oil supplier). However, the other alternatives identified provide the potential for significant reduction in the Territory's outlays for petroleum products if waste oil can be utilized locally. It is therefore recommended a detailed waste oil utilization study be conducted individually (perhaps as a portion of the next Territorial solid waste management planning effort); or in conjunction with the other islands of the Pacific Basin in a similar situation (e.g., Trust Territories and the Government of Northern Marianas).

6D.3 Submit Request for Fiscal Year 1979 Funding

Request to EPA for Fiscal Year 1979 funding must be included in the June draft of the 1978 work plan submittal. The work plan is the Fiscal Year 1979 activities plan. Final draft is due August 1978.

6D.4 Administration of Hazardous Waste Management Program

If it is determined it is in the Territory's best interest to administer the hazardous waste management program promulgated by PL94-580 in lieu of the Federal program, the following steps must be taken.

Fiscal Year 1978 (Man-Years)

• Investigate waste oil utilization (study administration only)	0.02 MY
• Prepare and submit request for Fiscal Year 1979 funding (hazardous waste portion only)	0.01 MY
• Prepare and apply for interim authority to administer hazardous waste program	0.15 MY
• Collect and dispose of unusable pesticides	0.02 MY
Fiscal Year 1978	0.20 MY

Fiscal Year 1979 (Man-Years)

• Continue investigation of waste oil utilization	0.04 MY
• Prepare and submit request for Fiscal Year 1980 funding	0.01 MY
• Administer interim hazardous waste program	0.30 MY
• Prepare for full authority	0.30 MY
Fiscal Year 1979	0.65 MY

Fiscal Year 1980 (Man-Years)

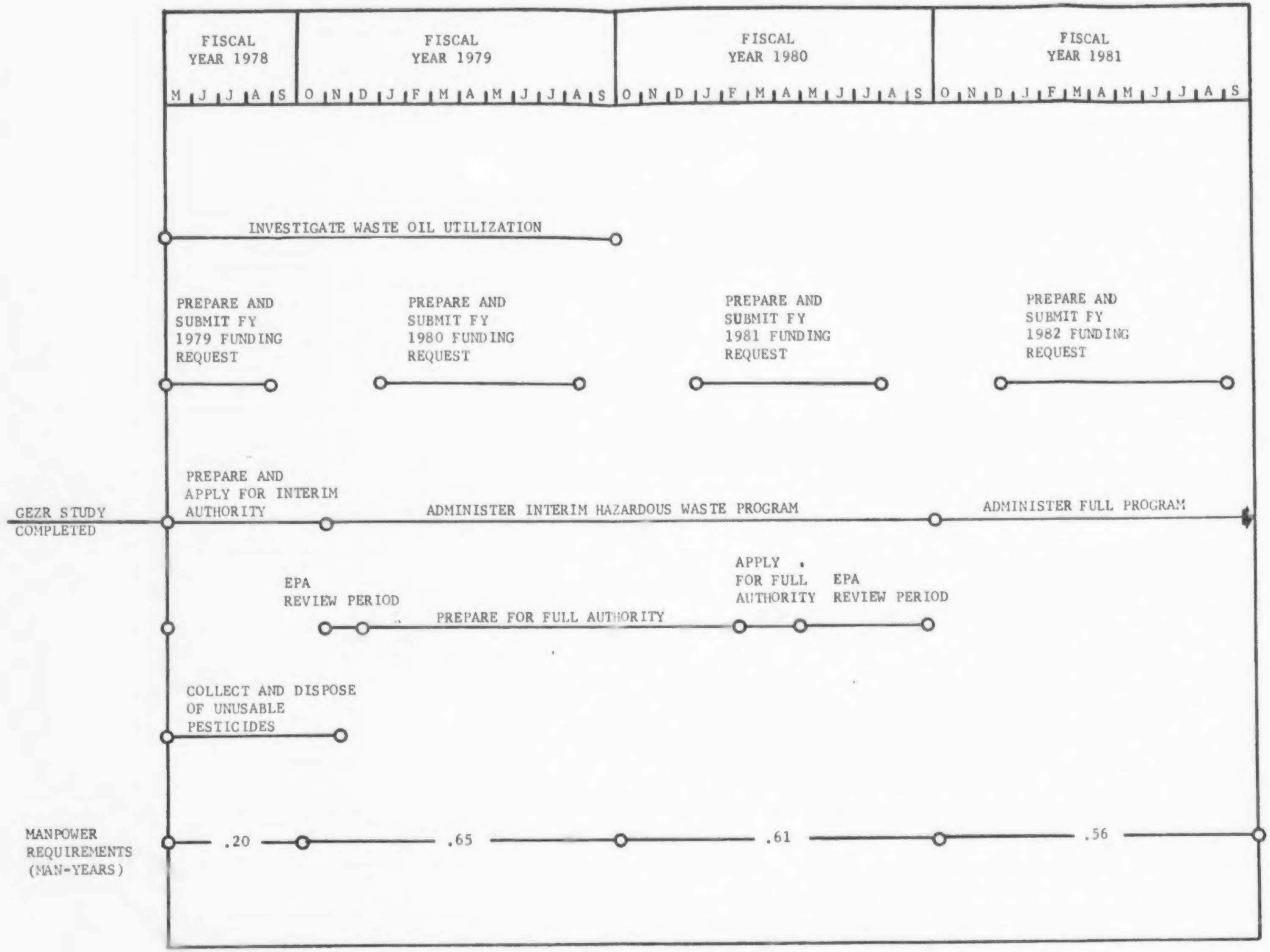
• Prepare and submit request for Fiscal Year 1981 funding	0.01 MY
• Administer interim hazardous waste program	0.30 MY
• Prepare and apply for full administrative authority	0.30 MY
Fiscal Year 1980	0.61 MY

Fiscal Year 1981 (Man-Years)

• Prepare and submit request for Fiscal Year 1982 funding	0.01 MY
• Administer full hazardous waste program	0.55 MY
Fiscal Year 1981	0.56 MY

The office best suited for administering and conducting such tasks is the Office of the Environmental Quality Commission.

SCHEDULE OF STRATEGY TASKS



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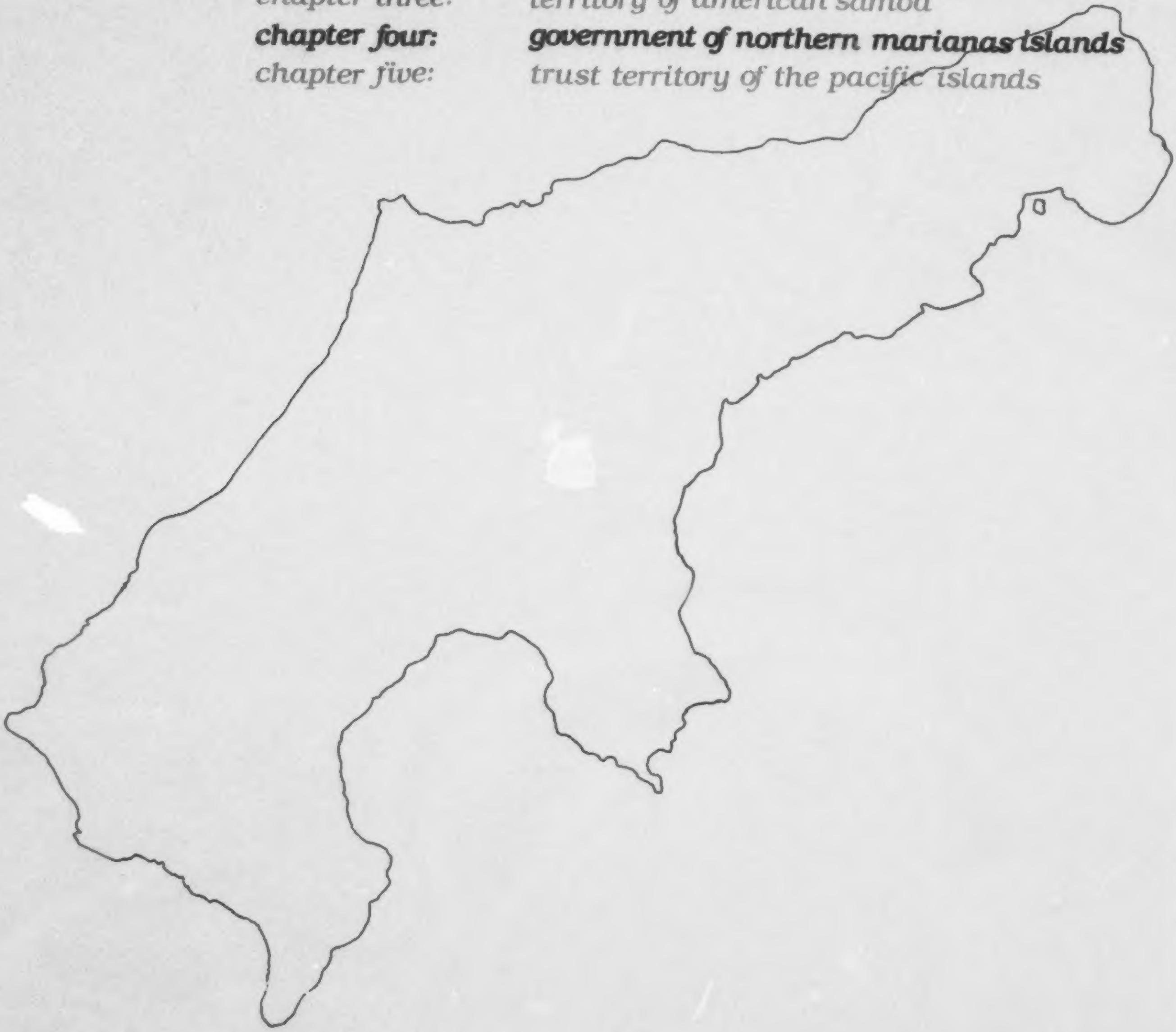
TRUST TERRITORY ISLANDS

HAZARDOUS WASTE MANAGEMENT

PROBLEM ASSESSMENT AND STRATEGY FORMULATION

chapter one: *state of hawaii*
chapter two: *territory of guam*
chapter three: *territory of american samoa*
chapter four: ***government of northern marianas islands***
chapter five: *trust territory of the pacific islands*



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INTRODUCTION

Background

The Government of Northern Marianas Islands (GNMI) achieved commonwealth status on January 9, 1978. While direct political ties with the remainder of the U. S. Trust Territory of the Pacific Islands (TT) are now severed, Trust Territory Headquarters are still located in Saipan, GNMI's main island. Plans are underway to relocate Trust Territory Headquarters over the next few years. Major islands of GNMI include Saipan, Tinian, and Rota. Latest population survey shows that Saipan, with a population of 10,459, houses 80 percent of GNMI's population. Government provides the greatest portion of local employement. Tourism is a rapidly growing industry in Saipan.

Summary of Chapter Findings and Recommendations

Hazardous waste generation and management practices were analyzed by reviewing past reports and conducting extensive field surveys of industrial and commercial enterprises and public agencies on the island of Saipan.

TASK 1 IDENTIFICATION OF CONDITIONS

Although the hazardous wastes generated in the Northern Marianas Islands are limited, they pose a significant threat to a small island environment.

TASK 2 STORAGE

Significant quantities of hazardous wastes are currently being stored in Saipan. These include:

- Asphaltic oil
- Calcium hypochlorite
- Miscellaneous suspended and unusable pesticides
- A transformer containing chlorextol

TASK 3 PROJECTIONS

Quantities of hazardous wastes are projected to increase in the future. However, this increase is not expected to significantly change the magnitude of the problem or the management practices necessary to protect human health and the environment.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

Hazardous wastes which are currently managed in an environmentally unacceptable manner are:

- Asphaltic oil
- Bilge water
- Chlorine containers
- Hospital wastes
- Spent pesticide containers
- Suspended and unusable pesticides
- Tank bottom sediments
- Tetraethyl lead sludge
- Waste lubricating oil

TASK 5 LAWS AND REGULATIONS

The Resource Conservation and Recovery Act of 1976 (PL94-580) requires Federal Environmental Protection Agency (EPA) to establish and administer a nationwide hazardous waste management program. States and territories are allowed to implement a substantially equivalent program in lieu of the Federal program. If the Territory does not, the Federal program will be put into effect and enforced by the EPA Region IX office. Laws and regulations would need to be promulgated to fulfill requirements for Territorial program administration.

TASK 6 RECOMMEND STRATEGY

The following recommendations provide for the proper management of hazardous wastes:

- Continue practices which are identified as environmentally acceptable.
- Leaking containers of asphaltic oil should be redrummed. This material should then be used or sold.
- Oil in the bilge water from the power barge should be completely removed prior to its discharge to the evaporation ponds.
- A pathological incinerator should be installed at Dr. Torres Hospital. Nonreturnable expired medicines should be incinerated, flushed to the sewer system, or receive separate burial at the landfill. Proper disposal requires a case-by-case decision.

- Spent chlorine containers should be triple-rinsed, punctured, crushed, and buried at the landfill.

- Spent pesticide containers must be triple-rinsed, punctured, and crushed prior to burial at the landfill in accordance with Federal EPA regulations.

- Suspended and unusable pesticides should be returned to the manufacturer if possible. Otherwise, they require disposal at at hazardous waste landfill. Storage, prior to disposal, should be in tightly closed containers in a cool, dry, secured area, with adequate ventilation.

- Tank bottom sediments should be buried in securely fastened steel drums in a specially designated area of the landfill.

- Tetraethyl lead sludge requires disposal in a hazardous waste landfill.

- Instituting waste reduction measures and arranging with bulk petroleum proudct suppliers to ship off island to a suitable rerefining facility is the most expedient method of properly managing waste lubricating oil. However, implementation of an alternative which permits direct reuse will prove very beneficial to local economies as the cost of petroleum products increases. It is therefore recommended a detailed waste oil utilization study be conducted.

The hydrogeologic conditions of Saipan preclude hazardous waste landfill siting without significant engineered features to protect ground water. However, consideration should be given to the development of a limited hazardous waste landfill for the disposal of wastes generated from time to time which are not considered extremely hazardous. Otherwise these wastes will require shipment off island for proper disposal.

TASK 1 IDENTIFICATION OF CONDITIONS

1A Review and Summation of Existing Reports

Two solid waste management studies have been conducted for the Marianas Islands (References 26 and 27). Neither, however, addresses hazardous waste management.

1B Expected Types of Hazardous Wastes

Table 4-1 lists the types of hazardous wastes that were expected to be found in the Northern Marianas Islands prior to conducting the survey.

1C Potential Hazardous Waste Generators

The primary producers of hazardous wastes in the Marianas Islands are:

- Dr. Torres Hospital
- GNMI Department of Agriculture
- GNMI Department of Public Works
- Petroleum Product Distribution Facility
- Service Stations and Garages

1D Survey Methodology

The agencies listed above were interviewed individually to determine types and quantities of hazardous waste. Table 4-2 summarizes the results of the survey.

TABLE 4-1

EXPECTED TYPES OF HAZARDOUS WASTES

Source	Type
Agricultural	• Spent Pesticide Containers • Suspended and Unusable Pesticides
Governmental	• Digested Sewage Treatment Sludge • Expired and Unusable Medicines • Pathological Wastes • Petroleum Wastes • Spent Pesticide and Chlorine Containers • Suspended and Unusable Pesticides
Industrial/Commercial	• Petroleum Wastes

TABLE 4-2

CURRENT HAZARDOUS WASTE GENERATION - NORTHERN MARIANAS ISLANDS

Waste Material	Source	Annual Quantity	
		Metric	English
Chlorine Containers	Water Treatment Plant	360 Drums	
Digested Sewage Sludge (Liters/Gallons)	Sewage Treatment Plants	456,000	120,000
Hospital Wastes (Kilograms/Pounds) • Pathologic Waste • Expired Medicines	Dr. Torres Hospital	 600 2	 1,300 5
Oil Contaminated Bilge Water (2-3% Oil) (Liters/Gallons)	Power Barge	1,664,400	438,000
Pesticide Containers	GNMI Agriculture Office Total Containers	190 Misc. Sacks 230 Misc. Bottles 420 Items	
Tank Bottom Sediment (Liters/Gallons)	Petroleum Products Distribution Facility	2,000	500
Tetraethyl Lead Sludge (Liters/Gallons)	Petroleum Products Distribution Facility	2,000	500
Waste Oil (Liters/Gallons)	• Power Plant • Vehicles - Government - Private Total Waste Oil	26,600 4,800 34,300 65,800	7,000 1,300 9,000 17,300

TASK 2 STORAGE

Hazardous wastes which are currently stored in the Northern Marianas Islands are as follows:

- Airport
  - Approximately one hundred 210 liter (55 gallon) drums of asphaltic oil
  - Nine 115 liter (30 gallon) drums of Dieldrin
- GNMI Department of Agriculture
  - 135 kilograms (300 pounds) miscellaneous pesticides
- GNMI Department of Public Works
  - One transformer containing approximately 4,560 liters (1,200 gallons) chlorextol
- Trust Territory Supply Office
  - 6,000 kilograms (13,200 pounds) Sodium Arsenite
  - 40,000 kilograms (88,000 pounds) Calcium Hypochlorite

TASK 3 PROJECTIONS

Projections of hazardous waste generation in the Northern Marianas Islands are presented in Table 4-3. Methodology utilized in preparing these projections is discussed below.

3A Chlorine Containers

It is assumed empty chlorine container generation will parallel population growth. Population trends are based on projections presented in Reference 12.

3B Digested Sewage Sludge

It is assumed the increase in sewage sludge generation will parallel population growth.

3C Oil-Contaminated Bilge Water

It is assumed use of the power barge will be phased out within the next five years due to the construction of the new power plant. This will eliminate entirely this waste material.

3D Pathologic Wastes

It is assumed pathologic waste production will parallel population growth.

3E Pesticides

The socioeconomic development plan for the Northern Marianas Islands (Reference 27) calls for ten percent per annum increase in crop production. It is therefore assumed pesticide usage trends will follow the same growth pattern.

3F Tank Bottom Sediments

It is assumed tank bottom sediment generation, resulting primarily from fuel storage, will parallel electricity production trends.

3G Tetraethyl Lead Sludge

It is assumed tetraethyl lead sludge generation, resulting primarily from leaded gasoline storage, will parallel the growth in number of automobiles.

TABLE 4-3 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, NORTHERN MARIANAS ISLANDS, 1977 (SHEET 1 OF 1)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Chlorine Containers (Units)	360 Units		415 Units		490 Units	
Digested Sewage Sludge (Liters/Gallons)	456,000	120,000	526,000	138,000	624,000	164,000
Oil Contaminated Bilge Water (Liters/Gallons)	1,664,400	438,000	--	--	--	--
Pathologic Wastes (Kilograms/Pounds)	600	1,300	690	1,500	820	1,800
Pesticide Containers (Units)	420 Units		680 Units		1,090 Units	
Tank Bottom Sediments (Liters/Gallons)	2,000	500	6,000	1,600	6,000	1,600
Tetraethyl Lead Sludge (Liters/Gallons)	2,000	500	2,600	700	3,000	800
Waste Oil (Liters/Gallons)						
• Power Plant	26,600	7,000	83,600	22,000	83,600	22,000
• Vehicles	39,100	10,300	49,600	13,100	57,500	15,100
Population*	14,358		16,549		19,642	

* Extrapolated from projections provided in Reference 3.

3H Waste Oil

The addition of three 7.5 megawatt diesel generators is planned for the near future. This new plant is expected to produce approximately 57,000 liters (15,000 gallons) of waste oil per year. It is anticipated sufficient electrical power can be produced to meet Saipan's needs through the year 2000.

Increase in waste lubricating oil from vehicles is based on automobile projections reported in Reference 12.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

4A Identified Haulers and Storage, Processing, Recovery, and Disposal Site Operators

There are no commercial hazardous waste haulers in the Northern Marianas Islands. All wastes are either stored or disposed of on-site, or transported to the disposal area by the generator.

4B Evaluation Criteria

Criteria utilized in evaluating the various hazardous waste management practices is presented in Appendix B.

4C Investigation of Identified Operations

Field surveys of all identified storage and disposal operations were undertaken in July and December 1977. Descriptions and evaluations of current hazardous waste management practices are presented in the following Section (4D).

4D Evaluation of Practices

Evaluations of identified hazardous waste management operations, discussed below, are summarized in Table 4-4.

4D.1 Asphaltic Oil

Several of the drums containing asphaltic oil, located near the airport runway, are leaking. There are no barriers to inhibit the flow of this oil into the surrounding area. This storage is not considered environmentally acceptable.

4D.2 Chlorine Containers

Empty containers of chlorine (utilized for disinfection of drinking water) are stored at the water treatment plant, then transported to the landfill. This practice would be adequate if the containers were properly triple-rinsed, punctured, and crushed prior to landfilling.

4D.3 Hospital Wastes

Pathologic wastes and expired medicines are currently disposed of with the general refuse. This practice does not provide adequate safeguards to human health.

TABLE 4-4 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, NORTHERN MARIANAS ISLANDS, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Asphaltic Oil	Leaking Drums (No)	N/A	N/A	N/A
Chlorine Containers	On-Site (Yes)	Truck (Yes)	None (No)	Landfill (Yes)*
Hospital Wastes				
• Pathologic	None	With General Refuse (No)	None (No)	Landfill (No)
• Expired Medicines	None	With General Refuse (No)	None (No)	Landfill (Yes)**; Returned to Manufacturer (Yes)
Oil Contaminated Bilge Water	Steel Tank (Yes)	None	Gravity Separation	Evaporation/Percolation (Yes)***
Spent Pesticide Containers	None	With General Refuse (No)	None (No); Rinsed (No)	Landfill (Yes)*; Reuse (No)
Suspended and Unusable Pesticides	Locked Storeroom (Yes) Leaking Drums (No)	N/A	N/A	N/A
Tank Bottom Sediment	Steel Drums (Yes)	Truck (Yes)	None	Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (Yes)	Truck (Yes)	None	Landfill (No)
Waste Oil	Steel Drums (Yes)	None	None	On-Site Ground Disposal (No)

* Acceptable if properly triple rinsed, punctured and crushed.
** Expired medicines can also be incinerated or severed. Proper disposal requires a case-by-case decision.
*** Acceptable if adequate oil separation has occurred.

4D.4 Oil-Contaminated Bilge Water

Bilge water is pumped from the power barge to a large steel tank. Here the oil and water are allowed to separate by gravity. The wastewater is then discharged to ponds for disposal by evaporation and percolation. The existence of oily sludge in portions of the ponds indicates improper separation occurs at times. Ponding of bilge water without relatively complete oil removal does not provide adequate ground water protection.

4D.5 Pesticides

Pesticide containers are disposed of unrinsed along with the general refuse, or rinsed and given to farmers for reuse. Due to the high toxicity of pesticide residues which may remain even after rinsing, neither of these practices provides adequate safeguards. Suspended and unusable pesticides are adequately stored at the Agriculture Office's pesticide supply room. The pesticide drums at the airport are not stored in a manner which adequately contains this highly toxic material.

4D.6 Tank Bottom Sediments and Tetraethyl Lead Sludge

Petroleum products storage tanks at the bulk distribution facility are cleaned periodically by a private contractor. The tank bottom sediment, a mixture of rust, oil, sand, dirt, and water, is collected and transported in steel drums. The sediments are dumped at the landfill and the drums are reused. Tetraethyl lead sludge, generated during the periodic cleaning of the leaded gasoline storage tank, is handled in a similar manner. Due to the potential ground and surface water contamination associated with landfilling these oily and heavy metal containing materials, neither of these wastes is considered managed in an environmentally acceptable manner.

4D.7 Waste Oil

Waste lubricating oils from the diesel power plants, the GNMI motor pool, and the major service stations and garages are dumped on the grounds of each facility. Due to potential for ground and surface water contamination, this disposal practice is not considered environmentally acceptable.

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TABLE 4-5

FEDERAL STATUTES DEALING WITH HAZARDOUS WASTE MANAGEMENT*

Statute/ Administering Agency	Description
Resource Conservation and Recovery Act of 1976 (PL94-580)/Environmental Protection Agency	Places primary responsibility to regulate management of hazardous wastes on EPA.
Toxic Substances Control Act of 1976 (PL94-469)/EPA	Authorizes research and regulation of those substances found to be hazardous.
Section 112 of the Clean Air Act Amendments of 1970 (PL91/604)/EPA	Authorizes the setting of standards for hazardous air pollutants and controls the incineration of hazardous wastes.
Federal Water Pollution Control Act Amendments of 1972 (PL92-500)/ EPA	Authorizes control over toxic pollutants discharged into water from point sources, the removal of toxic pollutants from critical port and harbor areas, and a plan describing the process for the disposal of pollutants.
National Environmental Policy Act of 1969 (NEPA) (PL91-190)/Not Specified	Requires the preparation of an environmental impact statement for all Federal hazardous waste management activities.
The Occupational Safety and Health Act of 1970 (OSHA) (PL91-596)/ Department of Labor	Authorizes the setting of mandatory standards to protect people working with hazardous materials.
The Poison Prevention Packaging Act of 1970 (PL91-601)/Department of Health, Education, and Welfare	Authorizes the establishment of special packaging standards for hazardous household substances.
The Federal Hazardous Substances Labelling Act of 1960 (PL86-613)/ Department of Transportation (DOT)	Prohibits the transport of hazardous substances that have been misbranded or the labels have been removed.
Hazardous Materials Control Act of 1970 (PL91-458)/DOT	Authorizes an evaluation of the hazards associated with transporting hazardous materials.

* Reference 16

TABLE 4-5 - (Continued)

Statute/ Administering Agency	Description
Transportation of Explosives Act (U. S. Code, Title 18, Chapter 39)/ DOT	Prohibits the unregulated transport of dangerous materials.
The Safety Regulation of Civil Aeronautics Act of 1958 (PL85-726)/Federal Aviation Administration of DOT	Authorizes FAA to develop air transportation standards to provide adequate safety.
The Hazardous Cargo Act (U. S. Code, Title 46, Chapter 7)/U. S. Coast Guard	Places controls on the water transport of dangerous substances.
The Food, Drug, and Cosmetic Act Animal Drug Amendments of 1968 (PL90-399)/Not Specified	Prohibits the misbranding of certain consumer items.
The Marine Protection Research and Sanctuaries Act of 1972 (PL92-532)/ EPA	Prohibits the transport for ocean dumping of many extremely hazardous wastes.
The Coastal Zone Management Act of 1972 (PL92-583)/Not Specified	Requires that coastal management agencies regulate hazardous waste disposal.
Section 212 of the Resource Recovery Act of 1970 (PL91-512)/EPA	Requests a study of the feasibility of a system of national hazardous waste disposal sites.
Safe Drinking Water Act of 1974 (PL93-523)/EPA	Authorizes regulation of underground injection of toxic wastes.
The Atomic Energy Act of 1954, as Amended (PL83-703)/NRC and Private Industry	Authorizes the management of radioactive wastes generated in fission reactions.
The Armed Forces Appropriation Authorization Acts of 1969 and 1970 (PL91-121; PL91-441)/Not Specified	Limits the use of Federal funds for disposal of chemical and biological warfare agents.
The Federal Environmental Pesticide Control Act of 1972 (PL92-516)/EPA	Requires the establishment of procedures and regulations for the disposal of pesticides.

- Establishment of legislative authority to control on-site and off-site disposal of hazardous wastes.

- Identification of resources (manpower, matching funds, etc.) to conduct the program.

- Development of a hazardous waste storage, treatment, and disposal permit system which is substantially equivalent to the Federal system.

- Establishment of surveillance and enforcement procedures.

- Development of a plan to bring all elements of the program into compliance with requirements for full authorization by October 21, 1980.

Application should be made to the Administrator of EPA Region IX between July 20 and October 20, 1978.

The following is a guideline for development of a hazardous waste management program consistent with current draft (January 1978) EPA regulations promulgated under PL94-580.

5B.1 Legislative Authority to Establish Standards for Hazardous Waste Management

5B.2 Hazardous Waste Criteria

- Establishment of criteria for the identification of hazardous wastes (toxicity, persistence, flammability, corrosiveness, infectiousness, reactiveness, radioactivity).

- Establishment of a list of particular wastes which will be subject to regulation.

5B.3 Issuance of Standards Applicable to Generators of Hazardous Wastes

- Record-keeping practices that accurately identify the quantity, composition, and disposition of hazardous wastes generated.

- Labelling practices for any containers of hazardous waste.

- Containerization per U. S. Department of Transportation (DOT) requirements.

- Furnishing of information on the general chemical composition of hazardous waste to persons transporting, treating, storing, or disposing of the wastes.

- Use of a manifest system to assure all hazardous wastes generated are designated for treatment, storage, or disposal at facilities for which permits have been obtained.

- Submission of reports to a responsible agency setting out quantities generated and disposition means.

5B.4 Issuance of Standards Applicable to Transporters of Hazardous Wastes

- Record-keeping concerning hazardous wastes transported, including source and delivery points.

- Transportation of hazardous waste only if properly labelled and containerized.

- Compliance with the manifest system.

- Transportation of hazardous wastes only to permitted facilities.

- Coordination with DOT regulations.

5B.5 Issuance of Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- Record-keeping of hazardous wastes accepted and the manner in which the wastes were treated, stored, or disposed.

- Submission of reports with respect to manifest violations, accidents, operating conditions, and monitoring.

- Treatment, storage, or disposal of hazardous wastes received pursuant to approved procedures.

- Location, design, and construction of hazardous waste treatment, disposal, or storage facilities.

- Monitoring of air and ground water/leachate and regular inspection of facility operations.

- Contingency plans for effective action to minimize unanticipated damage from any treatment, storage, or disposal of any hazardous waste.

- Training of all facility personnel which is approved by the permitting agency.

- Maintenance of facility.

- Ownership, continuity of operations, and financial capability to cover possible accidents and closure costs.

- Performance necessary to protect the environment and human health.

- Landfills must be underlined with four feet of soil having a minimum permeability of 10^{-8} centimeters per second or be constructed with an equivalent mechanically designed system (use of impervious liners) for leachate collection.

- Incinerators must achieve 99 percent combustion efficiency and operate above 1,000°C (1,832°F) for two seconds, or equivalent.

5B.6 Permits for Treatment, Storage, or Disposal of Hazardous Wastes

- Require each owner or operator to submit specified information in the permit application to ensure the permitting agency can make the most efficient and expedient determination possible.

- Mandate time limits for the application, submission, and review process within which both the permitting agency and the applicant or permittee must act.

- Require a compliance schedule to bring existing facilities into compliance with the act.

- Establish revocation procedures and circumstances.

5B.7 Preliminary Notification

- Require notification by hazardous waste handlers within 90 days of promulgations of regulations.

5B.8 Enforcement Provisions

- Establishment of enforcement staff and adequate budget allocations to carry out program.

- Establishment of authority to inspect facilities, copy records, and obtain samples.

- Delineation of agency responsibilities.

5B.9 Compliance Provisions

- Establishment of procedures for informing violators.

- Establishment of civil and criminal penalties for noncompliance.

TASK 6 RECOMMENDED STRATEGY

6A Alternatives to Environmentally Unacceptable Practices

Waste handling and disposal practices identified in Task 4D as environmentally unacceptable are presented in Table 4-6.

6B Evaluation of Alternatives

6B.1 Asphaltic Oil

If possible, the contractor who left the drums should be contacted for removal. If ownership is transferred to the government, all leaking containers of asphaltic oil should be redrummed. This material should then be moved to the abandoned runway where the old construction equipment is being stored. An earth berm should be constructed around drums. If the oil cannot be used on island, it should be sold. The American Samoa Department of Public Works might be a potential purchaser. They will be conducting extensive road construction and maintenance in the near future.

6B.2 Calcium Hypochlorite

The calcium hypochlorite in storage should be tested to determine its usability. If found usable, it should be utilized at the water treatment plants. If not, disposal should occur in California. This shipment should be coordinated with the disposal of suspended and unusable pesticides (refer to Section 6B.6).

6B.3 Hospital Wastes

6B.3.1 Pathological Wastes

All pathological wastes should be incinerated at the generation point. The approximate cost of a new incinerator (45 kilogram/100 pound per hour capacity) for Saipan is $21,000.*

6B.3.2 Expired and Unusable Medicines

If possible, all expired and unusable medicines should be returned to manufacturer for credit. For those medicines which cannot be returned, any one of the following is an acceptable practice:

- Incineration at hospital

---

* This cost includes freight, installation, and on-site training by a manufacturer's representative.

TABLE 4-6 - ALTERNATIVES TO PRESENT ENVIRONMENTALLY UNACCEPTABLE PRACTICES, NORTHERN MARIANAS ISLANDS, 1977 (SHEET 1 OF 1)

Hazardous Waste	Storage	Transport	Recovery/Reuse	Treatment	Disposal Point
Asphaltic Oil	Redrum Leaking Containers	--	Sell or Use	--	Require Contractor to Remove Drums; Sell or Use
Hospital Waste					
• Pathological	Plastic Bags	--	--	Incineration at Generation Point	Hospital Incinerator;
• Expired Medicines	Original Containers	Hand/Truck	--	--	Return to Manufacturer; Landfill Hospital Incinerator; Sewer System*
Calcium Hypochlorite	Steel Drums	DOT Regulations**	Test to Determine Usability	--	Water Treatment Plants (if Usable); Hazardous Waste Landfill** (if Unusable)
Oil Contaminated Bilge Water	Tank	--	Recover Separated Oil and Reuse as Supplemental Fuel Oil	Oil Separation; Centrifugation (if Required)	Effluent to Ponds***
Pesticide Containers	Secured Area, Protected from Weather	--	--	Triple-Rinsed, Punctured, Crushed	Landfill
Suspended and Unusable Pesticides	Locked Storehouse in Secured Area	DOT Regulations**	Remanufacture	--	Return to Manufacturer; Hazardous Waste Landfill
Tank Bottom Sediments	Steel Drums	--	--	--	Landfill (Sealed Drums)
Tetraethyl Lead Sludge	Steel Drums	--	--	--	Hazardous Waste Landfill
Unusable Transformer Containing PCB Fluid	--	DOT Regulations**	--	--	Hazardous Waste Landfill
Waste Oil	Drums/Tanks	--	Recovery Via Supplemental Fuel Use		Lube Oil Supplier; Power Generating Facility; Shipment to Guam for Rerefining

* Proper disposal requires a case-by-case decision.

** U.S. Department of Transportation.

*** Refer to Waste Oil for disposal points for separated oil.

- Separate disposal at the landfill
- Flushed to the sewer system

Proper disposal requires a case-by-case decision.

6B.4 Petroleum Waste Products

6B.4.1 Bilge Water

To insure adequate treatment of bilge water from the power barge, effluent flowing through from the storage tank should be passed through an API oil separator. Effluent from the separator will then be suitable for ponding.

6B.4.2 Tank Bottom Sediments

Tank bottom sediment disposal should be limited to the island landfill. The sludge should be disposed in securely fastened steel drums, placed in a special pit, and covered. The pit area should be well marked and properly recorded on appropriate land use plans.

6B.4.3 Tetraethyl Lead Sludge

Tetraethyl lead sludge requires disposal in a hazardous waste landfill because of its toxic organic lead content. The cost of shipping to California and disposition of the 5,700 liters (1,500 gallons) requiring shipment every three years is approximately $2,600 (refer to Appendix D for shipping and disposal costs).

6B.4.4 Waste Lubrication Oil

Lubricating oil, particularly troublesome in an island environment, is reclaimable. Recovery should be given highest priority. It can be rerefined for reuse as a lubricant or utilized as a supplemental fuel oil. Reuse alternatives which are potentially feasible include:

- Installation of centrifuges at all power plants to reduce waste quantities.
- Arrangements with oil suppliers to return lubricating oil to the manufacturer for reprocessing.
- Shipment to Guam for rerefining.
- Use as a diesel fuel supplement at the power plant or in heavy construction equipment.

While detailed engineering studies are required to determine the optimum strategy, the first two alternatives implemented simultaneously appears to be the most cost-effective and require minimal effort on the part of local waste oil generators.

Centrifuges remove solids and water contaminants accumulating over time and permit oil to be used 10 to 50 times longer, depending on site-specific conditions. The costs for centrifuge units are as follows:

Kilowatt Capacity	Cost*
500	$ 9,000
1,000	11,000
2,000	14,000

Arrangements with petroleum product suppliers for waste oil shipment off island to suitable rerefining facilities for recovery would relieve the Trust Territories in the short term of this potentially environmentally degrading waste. Shipments of lubrication oils to the islands are made in drums. Little expense would be incurred by the local bulk supplier to replace arriving drums with drums filled with waste oil. (For every two drums arriving, it is estimated only one will require return shipment; Reference 4.) Local generators would be responsible for arranging with the local supplier to transport their waste oil back to the bulk distribution plant. Union 76 is providing such a collection service for its customers in American Samoa. However, Union 76 is transporting the waste oil to the Tafuna landfill for disposal instead of shipping to a rerefining facility. In the long term, implementation of an alternative permitting local reuse of waste oil will prove very beneficial to island economies as the cost of petroleum products increases.

6B.5 Spent Pesticide Containers

All spent pesticide containers should be triple-rinsed, punctured, and crushed prior to burial, in accordance with U. S. Environmental Protection Agency regulations. If spent containers are stored prior to disposal, storage should be in a secured area, protected from the weather.

6B.6 Suspended or Unusable Pesticides

The acceptable alternatives for pesticide disposal are:

- Shipment back to manufacturer for credit or remanufacturing
- Shipment to a California hazardous waste disposal facility

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* This cost includes freight and installation.

If possible, pesticides should be returned to the manufacturer for credit or remanufacturing. If this is not possible, the pesticides should be shipped to California for disposal. Cost of shipping to and disposing of approximately 16,200 pounds of pesticides in California would be $2,800 (refer to Appendix D for transportation and disposal costs). Pesticide shipment requires containerization in accordance with DOT regulations.

While awaiting disposal, these pesticides should be stored in a locked storehouse within a secured area.

6B.7 Unusable Transformer Containing PCB Fluid

The transformer, becuase it contains PCB fluid, requires disposal at an EPA approved disposal facility. Disposal in California is recommended. The cost of disposal is approximately $3,000. The California State Department of Health is interested in accepting the transformer fluid in California for a test at a new liquid waste incinerator. If this can be arranged, the cost of disposing of the transformer might be reduced.

6C Identification of Potential Sites for Hazardous Waste Disposal

The hydrogeologic conditions of the Northern Marianas Islands preclude hazardous waste landfill siting without significant engineering design to protect ground water. However, consideration should be given to the development of a limited hazardous waste landfill for the disposal of wastes generated from time to time which are considered not extremely hazardous. Otherwise, these wastes will require shipment off island for proper disposal.

6D Territory Strategy

Figure 4-1 displays the strategy tasks recommended for the Northern Marianas Islands. Each task is discussed below.

6D.1 Island Cleanup

Shipment of all hazardous waste currently held in storage to California should be made. Continued storage is regarded as a significant potential hazard.

6D.2 Hospital Incinerators

It is recommended that a pathological waste incinerator be purchased for the hospital on Saipan.

6D.3 Investigate Waste Oil Utilization

The recommendation of Section 6B.4.4 provides the most expedient method of recovering waste oil (i.e., volume reduction and shipment of the remainder off-island via lubrication oil supplier). However, other alternatives identified provide potential for significant reduction in the Territory's outlays for petroleum products if waste oil can be utilized on island. It is therefore recommended that a detailed waste oil utilization study be conducted individually (perhaps as a portion of the next Territorial solid waste management planning effort); or in conjunction with the other islands of the Pacific Basin in a similar situation (e.g., American Samoa and the Trust Territory Islands).

6D.4 Submit Request for Fiscal Year 1979 Funding

Request to EPA for Fiscal Year 1979 funding must be included in the June draft of the 1978 work plan submittal. The work plan is the Fiscal Year 1979 activities plan. Final draft is due August 1978.

6D.5 Hazardous Waste Program Administration

If the Government elects to administer the hazardous waste program, the following are required:

6D.5.1 Prepare to Apply for Interim Authority

The following steps must be completed before application for interim authority to administer the Territory hazardous waste program can be submitted:

- Enactment of legislation providing authority to control on-site and off-site disposal (Title 13, Chapter 1 should suffice).

- Identification of adequate resources (funding, manpower, etc.) to implement interim program.

- Development of a permit system for storage, treatment, and disposal operations.

- Development of a surveillance plan and designation of a surveillance agency.

- Development of an implementation plan to bring the interim program up to standards of fully authorized program by October 20, 1980 (refer to Task 5 for requirements of a fully authorized plan).

6D.5.2 Apply for Interim Authority

Applications for temporary authorization to carry out the hazardous waste program should be submitted to the Region IX Administrator between July 20 and October 20, 1978. By the time of application, the proposed interim program must be in existence.

6D.5.3 Administer Interim Hazardous Waste Management Program

If authorization is granted, the Government of Northern Marianas Islands will be entitled to carry out the program in lieu of the Federal program for a twenty-four month period beginning October 20, 1978.

6D.5.4 Apply for Full Authority

EPA will have six months from date of submission to evaluate the Government of Northern Marianas Islands' full authority application. The application therefore must be submitted by April 20, 1980 to allow sufficient time for review before interim authorization terminates.

6D.5.5 Administer Full Hazardous Waste Management Program

If authorized, administration of full program would begin October 1980.

6E Manpower Requirements

The manpower required to implement the tasks proposed in Section 6D is as follows:

Fiscal Year 1978 (Man-Years)

• Conduct Island cleanup	0.09 MY
• Investigate waste oil utilization (study administration only)	0.08 MY
• Prepare and submit request for Fiscal Year 1979 funding (hazardous waste portion only)	0.01 MY
• Prepare and apply for interim authority to administer hazardous waste program	0.25 MY
Fiscal Year 1978	0.45 MY

Fiscal Year 1979 (Man-Years)

• Continue hospital incinerator procurement efforts	0.08 MY
• Continue investigation of waste oil utilization	0.04 MY
• Prepare and submit request for Fiscal Year 1980 funding	0.01 MY
• Administer interim hazardous waste program	0.30 MY
• Prepare for full authority	0.30 MY
Fiscal Year 1979	0.73 MY

Fiscal Year 1980 (Man-Years)

• Prepare and submit request for Fiscal Year 1981 funding	0.01 MY
• Administer interim hazardous waste program	0.30 MY
• Prepare and apply for full administrative authority	0.30 MY
Fiscal Year 1980	0.61 MY

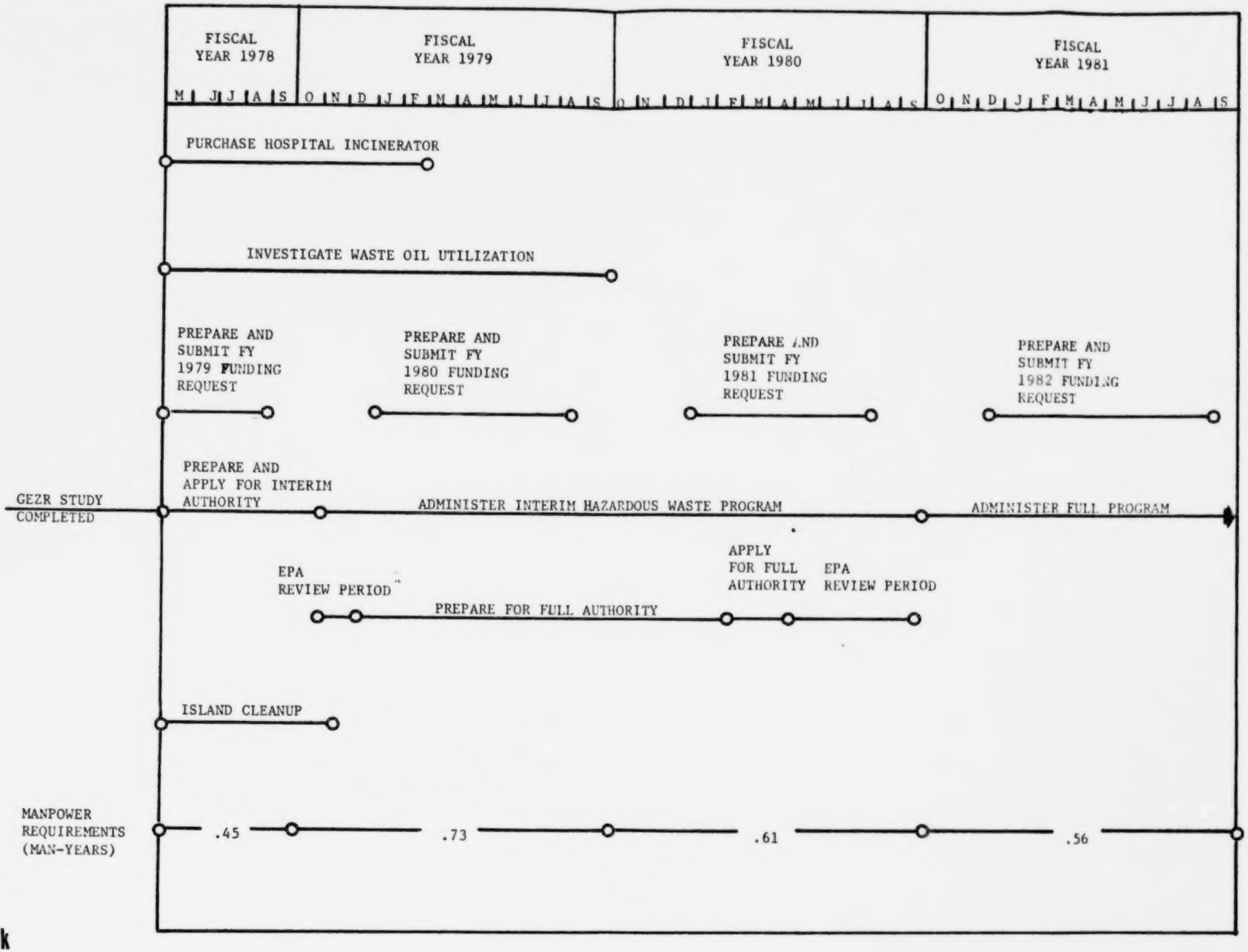
Fiscal Year 1981 (Man-Years)

• Prepare and submit request for Fiscal Year 1982	0.01 MY
• Administer full hazardous waste program	0.55 MY
Fiscal Year 1981	0.56 MY

The department best suited for administering and conducting such tasks is the proposed Northern Marianas Environmental Protection Board.

SCHEDULE OF STRATEGY TASKS

FIGURE 4-1



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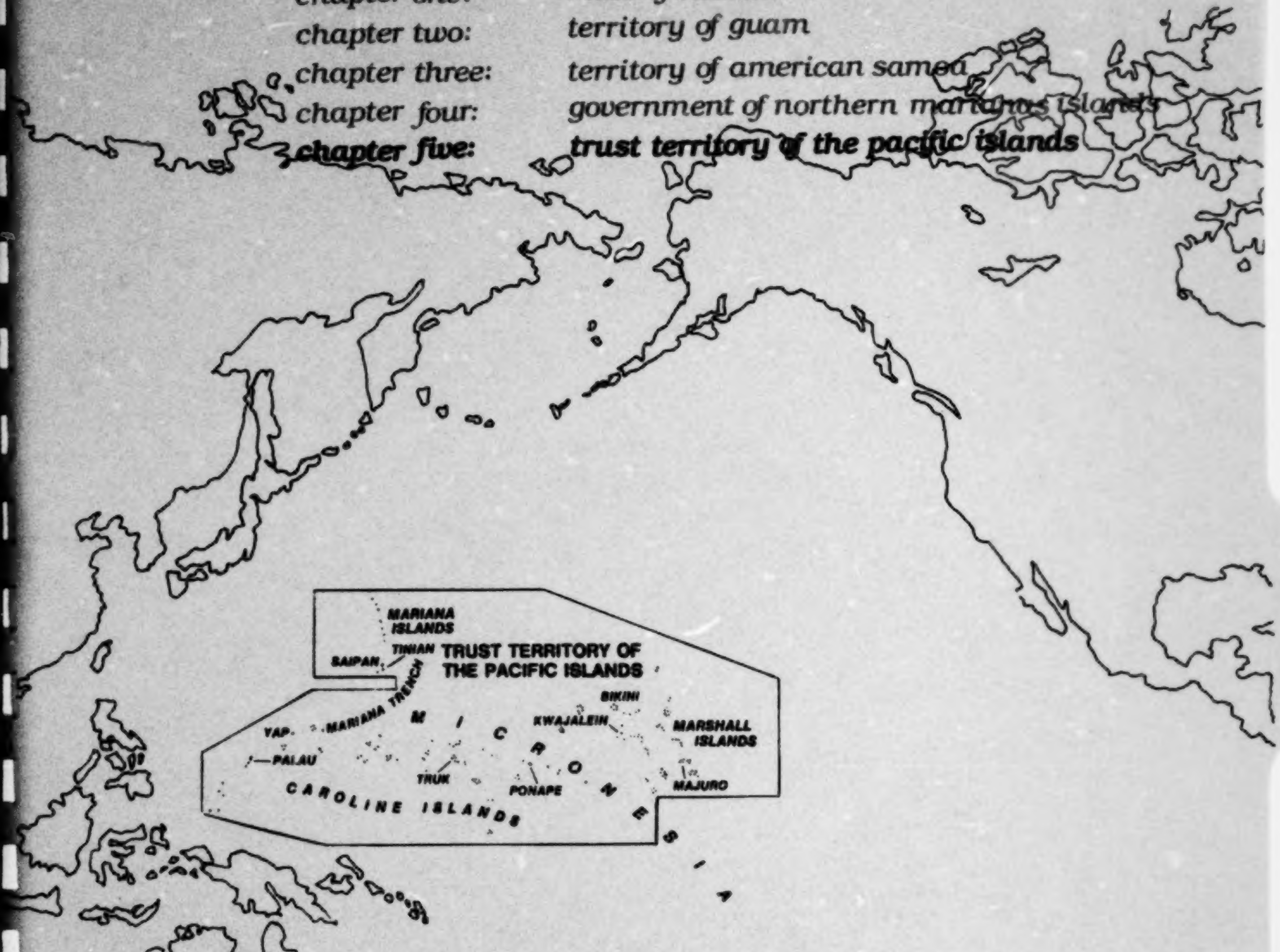
PREPARED FOR
HAWAII • GUAM • AMERICAN SAMOA • NORTHERN MARIANAS ISLANDS •
TRUST TERRITORY ISLANDS

HAZARDOUS WASTE MANAGEMENT

PROBLEM ASSESSMENT AND STRATEGY FORMULATION

chapter one: *state of hawaii*
chapter two: *territory of guam*
chapter three: *territory of american samoa*
chapter four: *government of northern marianas islands*
chapter five: ***trust territory of the pacific islands***


MARIANA ISLANDS
TINIAN
SAIPAN
TRUST TERRITORY OF THE PACIFIC ISLANDS
MARIANA TRENCH
BIKINI
YAP
PALAU
M I C R O N E S I A
KWAJALEIN
MARSHALL ISLANDS
TRUK
PONAPE
MAJURO
CAROLINE ISLANDS

FIVE 5

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INTRODUCTION

Background

The U. S. Trust Territory of the Pacific Islands is comprised of over 2,000 islands, of which less than one hundred are permanently inhabited. These islands lie scattered across three million square miles of the western Pacific Ocean, yet contain only 1,820 square kilometers (700 square miles) of land. The Territory is divided, for administrative purposes, into six districts, each of which exhibits notable physical, cultural, and social differences. District Centers are located at Majuro (Marshall Islands), Ponape (Eastern Caroline Islands), Moen (Truk District, Caroline Islands), Yap (Western Caroline Islands), and Koror (Palau District, Western Caroline Islands). Headquarters is currently housed in Saipan (Northern Marianas Islands). Due to the formation of the Government of Northern Marianas Islands, and its achievement of commonwealth status on January 9, 1978, plans are underway to relocate headquarters to Ponape Island.

Summary of Chapter Findings and Recommendations

Hazardous waste generation and management practices were analyzed by reviewing past reports and conducting extensive field surveys of industrial and commercial enterprises and public agencies on the District Center Islands of Majuro, Ponape, Truk (Moen), Yap, and Palau (Koror).

TASK 1 IDENTIFICATION OF CONDITIONS

Although hazardous wastes generated in the District Centers are limited, they pose a significant threat to a small island environment.

TASK 2 STORAGE

The hazardous wastes currently held in storage include:

- Asphaltic oil
- Calcium hyperchlorite
- Suspended and unusable pesticides

TASK 3 PROJECTIONS

Quantities of hazardous wastes are projected to increase in the future. However, this increase is not expected to significantly change the magnitude of the problem or the management practices necessary to protect human health and the environment.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

Hazardous wastes which are currently managed in an environmentally unacceptable manner are:

- Chlorine containers
- Hospital wastes
- Spent pesticide containers
- Tank bottom sediments
- Tetraethyl lead sludge
- Waste lubricating oil

TASK 5 LAWS AND REGULATIONS

The Resource Conservation and Recovery Act of 1976 (PL94-580) requires the Federal Environmental Protection Agency (EPA) to establish and administer a nationwide hazardous waste management program. While states and territories are usually allowed to implement a substantially equivalent program in lieu of the Federal program, the Trust Territory does not have the proper political status to do so. Therefore, the Federal program will be put into effect and enforced by the EPA, Region IX office. However, to provide local control of certain particularly relevant problems, it is recommended a hazardous waste regulation (as outlined in Section 5C) be enacted.

TASK 6 RECOMMENDED STRATEGY

The following recommendations provide for the proper management of hazardous wastes:

- Continue practices which are identified as environmentally acceptable.
- Leaking containers of asphaltic oil should be redrummed. This material may then be used or sold.
- All pathological wastes should be incinerated in a conventional incinerator utilizing supplemental fuel to maintain sufficiently high temperatures to insure sterilization. An incinerator should be purchased in Majuro, repairs made immediately to the incinerator at the Truk District hospital, and replacement or modification of the Palau District hospital incinerator to allow

supplemental fuel firing. In addition, the incinerators at the new Ponape and Yap District hospitals should be utilized as soon as possible. Non-returnable expired and unusable medicines should be separately buried at the landfill, incinerated, or flushed to the sewer system. Proper disposal of expired medicines requires a case-by-case decision.

- Spent chlorine containers should be triple-rinsed, punctured, and crushed and buried at the District landfill. They should not be stored in an unrinsed condition.

- Spent pesticide containers must be triple-rinsed, punctured, and crushed prior to burial at the District landfill or agriculture station in accordance with Federal EPA regulations.

- Suspended and unusable pesticides should be returned to the manufacturer if possible. Otherwise, they require disposal at a hazardous waste landfill. Storage prior to disposal should be in tightly closed containers in a cool, dry, secured area, with adequate ventilation.

- Tank bottom sediments should be buried in securely fastened steel drums in a specially designated area of the District landfill.

- Tetraethyl lead sludge requires disposal in a hazardous waste landfill.

- Instituting waste reduction measures and arranging with bulk petroleum products suppliers to ship off island to a suitable rerefining facility is the most expedient method of properly managing waste lubricating oil. However, implementation of an alternative which permits direct reuse will prove very beneficial to local economies as the cost of petroleum products increases. It is therefore recommended a detailed waste oil utilization study be conducted.

The hydrogeologic conditions of the District Centers preclude hazardous waste landfill siting without significant engineered features to protect ground water. The quantities requiring disposal do justify considering development of a limited hazardous waste landfill for the disposal of those wastes not considered extremely hazardous. Wastes which should be considered for local hazardous waste disposal are the unusable calcium hypochlorite and tank bottom sediments (excluding tetraethyl lead sludge) and any other such wastes which might be generated from time to time. Otherwise, the calcium hypochlorite and those extremely hazardous wastes generated will require shipment off island for proper disposal.

TASK 1 IDENTIFICATION OF CONDITIONS

1A A Review and Summation of Existing Reports

A solid waste management plan for the Eastern Districts (Majuro, Ponape, and Truk) is being developed (Reference 1). This report provides background information on current practices in these three eastern districts, evaluates new disposal sites, suggests system improvements, and proposes legislation. Three potentially hazardous wastes, pesticide containers, waste oil, and hospital wastes, are discussed. The report states pesticide containers on Ponape and Truk are "virtually nonexistent."

Waste oil resulting from equipment maintenance and harbor activities:

- "...is usually burned, but is occasionally used for dust control on roads." (Majuro)
- "...may be used to control dust at the airport. However, it was noted that some waste oil has been disposed of in a vacant swampy area in town." (Ponape)
- "...is utilized for dust control on the airfield." (Truk)

In discussing hospital waste, the report notes, "It is customary to give placental material and body parts to relatives of the patient for individual burial, with the result being that they do not require disposal in the waste system. Dressing, materials not given to relatives, and other hazardous wastes are:

- "...collected daily and transported to the landfill disposal area where they are burned and covered. There is no incinerator presently available for destruction of hospital wastes." (Majuro)
- "...collected and burned twice daily on the hospital grounds. Ashes are disposed of in the landfill, along with other hospital wastes." (Ponape)
- "...burned and covered daily on the hospital grounds." (Truk)

No previous reports dealing with hazardous waste management in the Western Districts (Yap and Palau) have been prepared.

1B Expected Types of Hazardous Wastes

Table 5-1 lists the types of hazardous wastes expected to be found in the Trust Territory, prior to undertaking the survey.

TABLE 5-1

EXPECTED TYPES OF HAZARDOUS WASTES

TRUST TERRITORY ISLANDS OF THE PACIFIC

Source	Type
Agricultural	• Suspended and unusable pesticides • Pesticide containers
Hospital	• Expired medicines • Pathological material
Industrial	• Miscellaneous processs residues • Waste lubricating oil • Petroleum product residues
Power Production	• Waste lubricating oil
Water and Sewage Treatment	• Chlorine containers • Sludge

1C Potential Hazardous Waste Generators

The primary producers of hazardous wastes in the Trust Territory are:

- District Agricultural Offices
- District Departments of Public Works
- District Forestry Departments
- District Hospitals
- Light Industry
- Petroleum Products Distribution Facility
- Service Stations and Garages

1D Survey Methodology

The governmental agencies listed in Task 1C, as well as all industries, were interviewed individually to determine types and quantities of hazardous wastes.

1E Generation Rates

Table 5-2 summarizes the results of the survey. Data reported by the military on Kwajalein is presented in Appendix E.

TABLE 5-2 - CURRENT HAZARDOUS WASTE GENERATION, TRUST TERRITORY ISLANDS OF THE PACIFIC, 1977 (SHEET 1 OF 2)

Waste Material	Source	Annual Quantity					
		Majuro		Ponape		Truk	
		Metric	English	Metric	English	Metric	English
Brine Sludge (Liters/Gallons)		00	00	00	00	00	00
Chlorine Containers	Water Treatment Plant	480 @ 50 Kg.	(110 Lb.)	360 @ 50 Kg.	(110 Lb.)	40 @ 50 Kg.*	(110 Lb.)
Pathologic Waste (Kilograms/ Pounds)	District Hospitals	21,500	47,200	35,400	77,900	8,600	18,900
Pesticide Containers	District Agriculture Offices	20 Units		47 Units		30 Units	
	Forestry Offices	N/A		13 Units		N/A	
Total Containers		20 Units		60 Units		30 Units	
Tank Bottom Sediments (Liters/Gallons)	Petroleum Products Distribution Facility	340	90	570	150	530	140
Tetraethyl Lead Sludge (Liters/Gallons)	Petroleum Products Distribution Facility	380	100	530	140	50	10
Waste Oil (Liters/Gallons)	Public Works						
	• Power Plant	54,000	14,300	16,700	4,400	13,800	3,600
	• Motor Pool	3,150	800	4,100	1,100	2,300	600
	Private Vehicles	3,150	800	3,000	800	400	100
	Ponape Transportation Authority	N/A	N/A	800	200	N/A	N/A
	Coast Guard	N/A	N/A	N/A	N/A	N/A	N/A
Total Waste Oil		60,300	15,900	24,600	6,500	16,500	4,300

* Currently not generated because of non-functioning chlorinator.

TABLE 5-2 - CURRENT HAZARDOUS WASTE GENERATION, TRUST TERRITORY ISLANDS OF THE PACIFIC, 1977 (SHEET 2 OF 2)

Waste Material	Source	Annual Quantity			
		Yap		Palau	
		Metric	English	Metric	English
Brine Sludge (Liters/Gallons)		00	00	41,000	11,000
Chlorine Containers	Water Treatment Plant	180 @ 50 Kg.	(110 Lb.)	330 @ 50 Kg.	(110 Lb.)
Pathologic Waste (Kilograms/ Pounds)	District Hospitals	9,600	21,200	32,200	70,800
Pesticide Containers	District Agriculture Offices	60 Units		300 Units	
	Forestry Offices	N/A		N/A	
Total Containers		60 Units		300 Units	
Tank Bottom Sediments (Liters/Gallons)	Petroleum Products Distribution Facility	280	70	930	240
Tetraethyl Lead Sludge (Liters/Gallons)	Petroleum Products Distribution Facility	200	50	580	150
Waste Oil (Liters/Gallons)	Public Works				
	• Power Plant	4,600	1,200	102,600	27,000
	• Motor Pool	800	200	7,100	1,900
	Private Vehicles	3,400	900	10,000	2,600
	Ponape Transportation Authority	N/A	N/A	N/A	N/A
	Coast Guard	11,800	3,100	N/A	N/A
Total Waste Oil		20,600	5,400	119,700	31,500

TASK 2 STORAGE

The types, quantities, and locations of hazardous wastes currently held in storage in the Trust Territory Districts are as follows:

Majuro:

District Hospital Storeroom

- 91 kilograms (200 pounds) of DDT.

Ponape:

District Agriculture Office

- 18.9 liters (five gallons) of DDT.
- 7.6 liters (two gallons) of Pratt B6N insect spray.

District Forestry Office

- Approximately 50 kilograms (110 pounds) of miscellaneous pesticides in powder form.
- Approximately eight liters (2.1 gallons) of miscellaneous pesticides in liquid form.

Truk:

District Agriculture Office

- Seven 113.6 liter (30 gallon) drums of Sodium Arsenite
- 22 kilograms (48 pounds) of Parathion
- 114 liters (30 gallons) of Endrin

Yap:

District Agriculture Office

- Three 50 kilogram (100 pound) drums of calcium hyperchlorite
- 80 kilograms (176 pounds) of DDT.
- Approximately one hundred and fifty containers of miscellaneous pesticides

Environmental Health Office

- Approximately three hundred 2.3 kilogram (five pound) containers of DDT.

Yap (Continued)

District Legislature's Equipment Rental Yard

- Approximately five hundred drums (209 liter/55 gallon) of asphaltic oil

Palau: None.

TASK 3 PROJECTIONS

Projections of hazardous waste generation in the Trust Territory are presented in Table 5-3. Methodology utilized in developing these projections is discussed below.

3A Chlorine Containers

It is assumed empty chlorine container generation will parallel population growth. Population trends are based on projections made in Reference 16 (for Majuro, Ponape, and Truk) and three percent per year increase based on 1973 census data (for Yap and Palau).

3B Digested Sewage Sludge

It is assumed in five years twenty percent of the population of each District's center will be served by a secondary treatment plant with sludge digestion and partial dewatering.

3C Pathological Wastes

It is assumed pathologic waste production will parallel population growth.

3D Pesticides

The anticipated increase in pesticide usage was estimated by each District Agriculturalist as follows:

- Majuro - "unknown."
- Ponape - "double in ten years."
- Truk - "triple in three years, then level off by the fifth year."
- Yap - "no increase."
- Palau - "triple in five years."

3E Tank Bottom Sediment

It is assumed tank bottom sediment generation, resulting primarily from fuel storage, will parallel electricity production trends.

TABLE 5-3 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, MAJURO (SHEET 1 OF 5)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Chlorine Containers	260 Items		340 Items		420 Items	
Digested Sewage Sludge (Cubic Meters/Yards)	00	00	1,000	1,300	1,200	1,600
Pathologic Wastes (Kilograms/Pounds)	21,500	97,200	54,800	61,500	67,600	75,800
Pesticide Containers (Units)	20 Units		N/A		N/A	
Tank Bottom Sediments (Liters/Gallons)	340	90	710	190	870	230
Tetraethyl Lead Sludge (Liters/Gallons)	380	100	530	140	680	180
Waste Oil (Liters/Gallons)	60,000	15,900	121,500	32,100	150,200	39,700
Population*	13,582		17,697		21,812	

* Population projections for Majuro, Ponape, and Truk based on data presented in Reference 1. Projections for Yap and Palau assume three percent increase per year, extrapolated from 1973 data.

TABLE 5-3 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, PONAPE (SHEET 2 OF 5)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Chlorine Containers	160 Units		190 Units		220 Units	
Digested Sewage Sludge (Cubic Meters/Yards)	00	00	1,200	1,600	1,300	1,700
Pathologic Wastes (Kilograms/Pounds)	35,400	77,900	42,000	92,300	48,800	107,200
Pesticide Containers (Units)	60 Units		90 Units		120 Units	
Tank Bottom Sediments (Liters/Gallons)	570	150	1,230	320	1,430	380
Tetraethyl Lead Sludge (Liters/Gallons)	530	140	650	170	760	200
Waste Oil (Liters/Gallons)	24,600	6,500	45,800	12,100	53,300	14,100
Population*	18,304		21,044		23,784	

* Population projections for Majuro, Ponape, and Truk based on data presented in Reference 1. Projections for Yap and Palau assume three percent increase per year, extrapolated from 1973 data.

TABLE 5-3 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, TRUK (SHEET 3 OF 5)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Chlorine Containers	40 Units		50 Units		60 Units	
Digested Sewage Sludge (Cubic Meters/Yards)	00	00	300	1,000	900	1,200
Pathologic Wastes (Kilograms/Pounds)	8,600	18,900	10,700	23,500	12,900	28,300
Pesticide Containers (Units)	30 Units		130 Units		130 Units	
Tank Bottom Sediments (Liters/Gallons)	530	140	1,000	260	1,190	310
Tetraethyl Lead Sludge (Liters/Gallons)	50	10	60	15	80	20
Waste Oil (Liters/Gallons)	16,500	4,300	29,300	7,700	35,200	9,300
Population*	11,337		14,162		16,987	

* Population projections for Majuro, Ponape, and Truk based on data presented in Reference 1. Projections for Yap and Palau assume three percent increase per year, extrapolated from 1973 data.

TABLE 5-3 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, PALAU (SHEET 5 OF 5)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Chlorine Containers	330 Units		380 Units		440 Units	
Digested Sewage Sludge (Cubic Meters/Yards)	00	00	900	1,200	1,100	1,400
Pathologic Wastes (Kilograms/Pounds)	32,200	70,800	37,100	81,600	43,300	95,100
Pesticide Containers (Units)	300 Units		900 Units		1,500 Units	
Tank Bottom Sediments (Liters/Gallons)	930	240	1,800	500	2,100	600
Tetraethyl Lead Sludge (Liters/Gallons)	580	150	630	170	680	180
Waste Oil (Liters/Gallons)	119,700	31,500	230,300	60,300	267,000	69,300
Population*	14,265		16,537		19,171	

* Population projections for Majuro, Ponape, and Truk based on data presented in Reference 1. Projections for Yap and Palau assume three percent increase per year, extrapolated from 1973 data.

TABLE 5-3 - FIVE- AND TEN-YEAR PROJECTIONS OF HAZARDOUS WASTE GENERATION, YAP (SHEET 4 OF 5)

Waste Material	Annual Quantity					
	1977		1982		1987	
	Metric	English	Metric	English	Metric	English
Chlorine Containers	180 Units		210 Units		240 Units	
Digested Sewage Sludge (Cubic Meters/Yards)	00	00	600	800	700	900
Pathologic Wastes (Kilograms/Pounds)	9,600	21,200	11,100	24,600	12,900	28,500
Pesticide Containers (Units)	60 Units		60 Units		60 Units	
Tank Bottom Sediments (Liters/Gallons)	280	70	420	110	490	130
Tetraethyl Lead Sludge (Liters/Gallons)	200	50	220	60	250	70
Waste Oil (Liters/Gallons)	20,600	5,400	35,800	9,400	41,200	10,800
Population*	8,857		10,267		11,903	

* Population projections for Majuro, Ponape, and Truk based on data presented in Reference 1. Projections for Yap and Palau assume three percent increase per year, extrapolated from 1973 data.

3F Tetraethyl Lead Sludge

It is assumed tetraethyl lead sludge generation, resulting primarily from leaded gasoline storage, will parallel growth in number of automobiles.

3G Waste Oil

Additions to existing power plants are planned in all districts. This will cause a corresponding increase in quantities of waste oil requiring disposal. The expected date of power plant completion and additional quantities of waste oil are as follows:

- Majuro - 32,500 liters (8,600 gallons) per year to begin in 1978.
- Ponape - 13,800 liters (3,600 gallons) per year to begin in 1978.
- Truk - 6,900 liters (1,800 gallons) per year to begin in 1978/79.
- Yap - 6,200 liters (1,600 gallons) per year to begin in 1978/79.
- Palau - 79,000 liters (20,800 gallons) per year to begin in 1978/79.

In addition, it is assumed each district's power requirements (and therefore waste oil output) will parallel population growth.

Based on population growth and automobile importation trends, the additional quantity of waste lubricating oil from vehicles requiring disposal is estimated to increase as follows:

- Majuro - 500 liters (130 gallons) per year.
- Ponape - 340 liters (90 gallons) per year.
- Truk - 150 liters (40 gallons) per year.
- Yap - 100 liters (30 gallons) per year.
- Palau - 300 liters (80 gallons) per year.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSING, AND DISPOSAL PRACTICES

4A Identified Haulers and Storage, Processing, Recovery, and Disposal Site Operators

There are no commercial hazardous waste haulers in the Trust Territory Islands. All wastes are stored or disposed of on-site, or transported to the disposal area by the generator.

4B Evaluation Criteria

Criteria utilized in evaluating the various hazardous waste management practices are presented in Appendix B.

4C Investigation of Identified Operations

Field surveys of all storage and disposal operations were undertaken in July 1977 in the Eastern Districts (Majuro, Ponape, and Truk) and December 1977 in the Western Districts (Yap and Palau). Descriptions and evaluations of current hazardous waste management practices are presented in the following section (4D).

4D Evaluation of Practices

Evaluations of identified hazardous waste management operations, discussed below, are summarized in Tables 5-4 (Majuro), 5-5 (Ponape), 5-6 (Truk), 5-7 (Yap), and 5-8 (Palau).

4D.1 Majuro

4D.1.1 Chlorine Containers

Chlorine containers are disposed of in the landfill. This disposal method is considered acceptable, provided the containers are properly triple-rinsed, punctured, and crushed prior to burial.

4D.1.2 Hospital Wastes

Hospital wastes are transported to the landfill in drums and burned under the supervision of a hospital attendant. Due to low temperatures and poor combustion characteristics of open burning, this disposal method does not adequately safeguard the public from the spread of infection and disease. The danger is increased by the occurrence of human and animal scavenging. Expired medicines are shipped to headquarters (in Saipan) for return to manufacturers.

TABLE 5-4 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, MAJURO, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Chlorine Containers	None	Hand Carried (Yes)	Rinsed (No)	Burned at Landfill (Yes)*
Hospital Wastes				
• Pathologic	None	Truck (Yes)	None	Burned at Landfill (No)
• Expired Medicines	On-Site (Yes)	None	None	Returned to Manufacturer (Yes)
Pesticide Containers	None	None	Rinsed (No)	Buried at Point of Use (Yes)*
Suspended and Unusable Pesticides	Locked Storeroom (Yes)	N/A	N/A	N/A
Tank Bottom Sediment	Steel Drums (Yes)	Truck (Yes)	None	Burned at Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (Yes)	Truck (Yes)	None	Burned at Landfill (No)
Waste Oil				
• Power Plant	Steel Drums (Yes)	Truck (Yes)	None	Burned at Landfill (No)
• Vehicles - Government	Steel Drums (Yes)	Truck (Yes)	None	Burned at Landfill (No)
• Vehicles - Private	Steel Drums (Yes)	None	None	Used for Lubrication and Weatherproofing (Yes); Dumped Indiscriminately (No)

4D.1.3 Pesticides

Pesticide containers are rinsed and buried in the field. Most are disposed of on a small (four hectares/10 acres) atoll which serves as the agricultural experimentation station. A caretaker is the only inhabitant of this island. Due to limited quantities of pesticides used, and the fact all pesticides are utilized under the supervision of District Agricultural Agents, this disposal method is considered acceptable, provided the agents are trained in the proper handling and disposal of containers. However, due to the geology of this island group (highly porous limestone soil developed from decomposed coral), there are no potential sites for burial of large quantities of banned pesticides or other hazardous materials.

4D.1.4 Tank Bottom Sediments and Tetraethyl Lead Sludge

Petroleum products storage tanks at the bulk distribution facility are cleaned periodically by a private contractor. The tank bottom sediment, a mixture of rust, oil, sand, dirt, and water, is collected and transported in steel drums. The sediments are dumped at the landfill and the drums are reused. Tetraethyl lead sludge generated during periodic cleaning of the leaded gasoline storage tank is handled in a similar manner. Due to potential ground and surface water contamination associated with landfilling these oily and heavy metal containing materials, neither of these wastes are considered managed in an environmentally acceptable manner.

4D.1.5 Waste Oil

Waste oil from the power plant and government vehicles is transported in drums to the landfill by Public Works Department personnel. Here it is poured on the refuse and burned. This operation (along with open burning of refuse in general) creates considerable smoke and potential leaching of heavy metals and is not considered to be an environmentally acceptable disposal method. Waste oil from service stations is generally reused for lubrication and weatherproofing. There was, however, some evidence of oil dumping on the service station property.

4D.2 Ponape

4D.2.1 Chlorine Containers

Chlorine containers are littered around the water treatment plant. They do not appear to be rinsed and are in close proximity to a small stream. This disposal method is not considered satisfactory.

TABLE 5-5 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, PONAPE, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Chlorine Containers	Open (No)	None	Non-Evident (No)	Littered Around Treatment Plant (No)
Hospital Wastes				
• Pathologic	None	Hand Carried to Incinerator (Yes)	None	Incineration (Yes)
• Expired Medicines	None	None	None	Returned to Manufacturer (Yes); Incinerated* (Yes)
Pesticide Containers	None	None	Rinsed (No)	Buried at District Agriculture Office (Yes)*
Suspended and Unusable Pesticides	Locked Building (Yes)	N/A	N/A	N/A
Tank Bottom Sediment	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Waste Oil				
• Power Plant	Steel Drums (Yes)	None	None	Dust Control on Roadways (No)
• Vehicles - Government	Steel Drums (Yes)	None	None	Dust Control on Roadways (No)
• Vehicles - Private	Steel Drums (Yes)	None	None	Reutilized for Lubrication and Weatherproofing (Yes)

* Based on incineration at new hospital.

** Acceptable if properly triple rinsed, punctured and crushed. In addition, certain medicines should not be incinerated because particulates and exhaust gasses emitted are toxic. These wastes can be either separately landfilled or sewered. Proper disposal requires a case-by-case decision.

4D.2.2 Hospital Wastes

Hospital wastes are presently burned in an open concrete incinerator which does not utilize supplemental fuel to insure high temperatures and complete combustion. Most expired medicines are returned to the manufacturer, either directly or through headquarters in Saipan. Some, however, are buried on the hospital grounds. While neither of these on-site practices is acceptable, the new hospital which is on the verge of completion will provide proper disposal of both hospital wastes and nonreturnable expired medicines. At the new site, a hospital type incinerator, utilizing diesel oil as supplementary fuel, has been installed. This incinerator (Spronz Model RL-10) is capable of converting 45 kilograms (100 pounds) of hospital wastes per hour to a sterile ash. The temperature will be high enough to decompose expired medicines as well. Certain medicines should not be incinerated because particulates and exhaust gases emitted are topic. These wastes can be separately landfilled or sewered. Proper disposal requires a case-by-case decision.

4D.2.3 Pesticides

Most pesticide containers are buried on District Agriculture Office grounds. Due to the limited number of containers requiring disposal, the high clay content of the soil, and the absence of water wells in the proximity of the grounds, this practice appears acceptable provided agriculture agents have sufficient training in proper handling and disposal of containers. This area is not, however, suitable for disposal of large quantities of banned pesticides. Pesticides requiring disposal at the District Forestry Office and District Agriculture Office are adequately stored in locked storerooms.

4D.2.4 Tank Bottom Sediments and Tetraethyl Lead Sludge

Petroleum products storage tanks at the bulk distribution facility are cleaned periodically by a private contractor. The tank bottom sediment, a mixture of rust, oil, sand, dirt, and water, is collected and transported in steel drums. The sediments are dumped at the landfill and the drums are reused. Tetraethyl lead sludge generated during periodic cleaning of the leaded gasoline storage tank is handled in a similar manner. Due to potential ground and surface water contamination associated with landfilling these oily and heavy metal containing materials, neither of these wastes is considered managed in an environmentally acceptable manner.

4D.2.5 Waste Oil

Waste oil from the power plant and government vehicles is stored in oil drums through the rainy season and used for dust control on the roads during the summer. While this is a common practice throughout the United States, it is not the optimum use of waste oil. Futher, use of waste oil on roadways which border mangrove swamps and streams creates the potential for contamination of surface waters. This practice is environmentally unacceptable. Waste oil from service stations is generally reused for lubrication and weatherproofing.

4D.3 Truk

4D.3.1 Chlorine Containers

Chlorine containers are disposed of in the landfill. This practice is acceptable provided containers are properly triple-rinsed, punctured, crushed, and buried

4D.3.2 Hospital Wastes

There is an adequate incinerator at the hospital; however, it is presently inoperative. The replacement burners were ordered over a year ago and have not yet been received. Hospital wastes are presently burned in the incinerator without supplemental fuel firing; however, due to inability to sustain high temperatures, combustion is incomplete, the ash residue is not assuredly sterile, and smoke is emitted from the incinerator stack. Expired medicines are returned to the manufacturer directly or through headquarters in Saipan.

4D.3.3 Pesticides

Pesticide containers are buried in the area where they are used. While this disposal method is suitable for the small number of containers requiring disposal, no suitable sites exist on the main island, Moen, for burial of large quantities of pesticides or other hazardous wastes. To date, banned pesticides have been (1) dumped into the lagoon, causing a major fish kill; and (2) sent to headquarters in Saipan for shipment to a Class I landfill site in California. Pesticides requiring disposal are adequately stored in a locked storeroom.

4D.3.4 Tank Bottom Sediments and Tetraethyl Lead Sludge

Petroleum products storage tanks at the bulk distribution facility are cleaned periodically by a private contractor. The tank bottom sediment, a mixture of rust, oil, sand, dirt, and water, is collected and transported in steel drums. The sediments are dumped at the landfill and the drums are reused. Tetraethyl lead sludge generated during periodic cleaning of the leaded gasoline storage tank is handled in a similar manner. Due to potential ground and surface water contamination associated with landfilling these oily and heavy metal containing materials, neither of these wastes is considered managed in an environmentally acceptable manner.

4D.3.5 Waste Oil

Waste oil from the power plant and government vehicles is presently used for dust and weed control at the airport. However, plans are being made to relocate and pave the landing strip. Thus, an alternative disposal method will have to be utilized in the near future. Waste oil from service stations is buried on-site in metal drums. These practices are environmentally unacceptable.

TABLE 5-6 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, TRUK, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Chlorine Containers	None	Truck (Yes)	Rinsing (No)	Buried at Landfill (Yes)*
Hospital Wastes				
• Pathologic	None	Hand Carried to Incinerator (Yes)	None	Incineration (Yes)**
• Expired Medicines	At Hospital (Yes)	None	None	Returned to Manufacturer (Yes)
Pesticide Containers	None	None	Rinsing (No)	Buried at Point of Use (Yes)
Suspended and Unusable Pesticides	Locked Storeroom (Yes)	N/A	N/A	N/A
Tank Bottom Sediments	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Waste Oil				
• Power Plant	Steel Drums (Yes)	Truck (Yes)	None	Dust Control at Airport (No)
• Vehicles - Government	Steel Drums (Yes)	Truck (Yes)	None	Dust Control at Airport (No)
• Vehicles - Private	Steel Drums (Yes)	None	None	Buried at Service Stations (No)

* Acceptable if properly triple rinsed, punctured and crushed.
** Acceptable only if incinerator is repaired.

4D.4 Yap

4D.4.1 Asphaltic Oil

Steel drums containing asphaltic oil are located at the District Legislature's Equipment Rental Yard. Because some of the drums are leaking this storage does not provide adequate safeguards to the environment.

4D.4.2 Chlorine Containers

Chlorine containers are rinsed and given to the public. As hand rinsing does not insure complete removal of this highly concentrated oxidizing agent, and the containers are often used for food and drinking water storage, continuation of this practice is considered a potential health hazard.

4D.4.3 Hospital Wastes

Hospital wastes are presently burned in an incinerator constructed from an oil drum. While this apparatus does a good job of combusting the refuse, sufficiently high temperatures to insure sterilization are not achieved. Small quantities of expired medicines are disposed of with the regular refuse. While neither of these practices is totally acceptable, a new hospital is being constructed (estimated completion July 1978) which has an adequate hospital type incinerator. This incinerator (P & T Manufacturing Model PU50) will provide proper disposal for both pathological wastes and expired medicines.

4D.4.4 Pesticides

Pesticides used at the District Agriculture Station are disposed of on-site. Bottles are rinsed, broken, and buried, while sacks are burned. Due to the limited number of containers, these practices are considered acceptable. This area is not, however, suitable for disposal of large quantities of restricted pesticides. Pesticides requiring disposal at the District Agriculture Office and Environmental Health Office are adequately stored in locked storerooms.

4D.4.5 Tank Bottom Sediments and Tetraethyl Lead Sludge

Petroleum products storage tanks at the bulk distribution facility are cleaned periodically by a private contractor. The tank bottom sediment, a mixture of rust, oil, sand, dirt, and water, is collected and transported in steel drums. The sediments are dumped at the landfill and the drums are reused. Tetraethyl lead sludge generated during periodic cleaning of the leaded

TABLE 5-7 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, YAP, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Asphaltic Oil	Leaking Drums (No)	N/A	N/A	N/A
Chlorine Containers	Open (No)	None	Rinsing (No)	Distributed to Public (No)
Hospital Wastes				
• Pathologic	None	Hand Carried to Incinerator (Yes)	None	Incineration (Yes)*
• Expired Medicines	None	None	None	Returned to Manufacturer (Yes)
Pesticide Containers	None	None	Bottles Rinsed and Broken (Yes)**	Sacks Burned (Yes);*** Bottles Buried at District Agriculture Office (Yes)
Suspended and Unusable Pesticides	Locked Building (Yes)	N/A	N/A	N/A
Tank Bottom Sediments	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (No)	Truck (Yes)	None	Buried at Landfill (No)
Waste Oil				
• Power Plant	Steel Drums (Yes); Concrete Sump (Yes)	None; Pumped to Tank Trailer (Yes)	None	Dust Control on Roadways (No)
• Vehicles - Government	Steel Drums (Yes)	None	None	Dust Control on Roadways (No)
• Vehicles - Private	Steel Drums (Yes)	None	None	Reutilized for Lubrication and Weatherproofing (Yes)
• Coast Guard	Concrete Sump (Yes)	Pumped to Tank Trailers (Yes)	None	Dust Control on Roadways (No)

* Based on incineration at new hospital.

** If triple-rinsed.

*** Acceptable due to limited quantities.

gasoline storage tank is handled in a similar manner. Due to potential ground and surface water contamination associated with landfilling these oily and heavy metal containing materials, neither of these wastes is considered managed in an environmentally acceptable manner.

4D.4.6 Waste Oil

Waste oil from the new power plant and the Coast Guard LORAN station is stored in concrete sumps. Oil from the old power plant and vehicles is stored in 209 liter (55 gallon) drums. All waste oil is being spread on the roads or at the airport for dust control. As discussed above, this practice creates the potential for ground and surface water pollution and is therefore considered environmentally unacceptable.

4D.5 Palau

4D.5.1 Brine Tank Sludge

Sludge collected in the bottoms of fish processing brine tanks is dumped into the bay once per year. While this sludge does not present any truly hazardous characteristics, disposal to the bay may cause nuisance conditions. A preferred disposal method, which the fish freezing company intends to follow, is pumping the sludge to the sewer line when the treatment plant becomes operational. Care must be taken to meter the sludge into the system so as not to overload the plant with a high concentration of salty, oxygen demanding wastes.

4D.5.2 Chlorine Containers

Chlorine containers are stored outside at the water treatment plant. They are not rinsed, punctured, or crushed, nor is protection from the weather provided. The containers are periodically hauled to the District landfill. These management practices do not provide adequate safeguards against contamination from residual chlorine.

4D.5.3 Hospital Wastes

Hospital wastes are burned in a Vent-O-Matic incinerator, Model SB/30, which is not equipped with a supplemental fuel firing system. The incinerator, as operated, does not provide sufficiently high temperatures to render the pathologic materials sterile, or to adequately decompose expired medicines.

TABLE 5-8 - EVALUATION OF CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES, PALAU, 1977 (SHEET 1 OF 1)

Waste Material	Storage Method (Meets Criteria?)	Collection Method (Meets Criteria?)	Treatment Method (Meets Criteria?)	Disposal Method (Meets Criteria?)
Brine Sludge	None	None	None	Pumped to Bay (No)
Chlorine Containers	Outside (No)	Truck (Yes)	None (No)	Buried at Landfill (Yes)*
Hospital Wastes				
• Pathologic	Steel Drum (Yes)	Hand Carried to Incinerator (Yes)	None	Low Temperature Incineration (No)
• Expired Medicines	At Hospital (Yes)	None	None	Low Temperature Incineration (No)
Pesticide Containers	Refuse Bins (Yes)	Refuse Collection Vehicle (Yes)	None	Landfill (Yes)*; Dumped On-Site (No)
Tank Bottom Sediments	Steel Drums (Yes)	None	None	Buried at Landfill (No)
Tetraethyl Lead Sludge	Steel Drums (Yes)	Truck (Yes)	None	Buried at Landfill (No)
Waste Oil				
• Power Plant	Underground Steel Tank (Yes)	Truck (Yes)	None	Dust Control (No); Open Burning (No)
• Vehicles - Government	None	None	None	Percolation into Soil (No)
• Vehicles - Private	Steel Drums (Yes)	None	None	Dust Control (No)

* If properly triple rinsed, punctured and crushed.

4D.5.4 Pesticides

Pesticides utilized in Palau are primarily limited to small container sizes. Containers are generally disposed of unrinsed, with the regular refuse. Some are deposited in a mangrove swamp behind the District Agricultural Station. Both of these practices allow for possible ground and surface water contamination and afford the possibility of poisoning scavengers who reuse the containers.

4D.5.5 Tank Bottom Sediments and Tetraethyl Lead Sludge

Petroleum products storage tanks at the bulk distribution facility are cleaned periodically by a private contractor. The tank bottom sediment, a mixture of rust, oil, sand, dirt, and water, is collected and transported in steel drums. The sediments are dumped at the landfill and the drums are reused. Tetraethyl lead sludge generated during periodic cleaning of the leaded gasoline storage tank is handled in a similar manner. Due to potential ground and surface water contamination associated with landfilling these oily and heavy metal containing materials, neither of these wastes are considered managed in an environmentally acceptable manner.

4D.5.6 Waste Oil

Waste oil from the power plant is collected in an underground steel tank. Periodically the tank is drained and the oil either transported to the landfill where it is burned in a separate pit or used for dust control on roadways. Waste oil from the District motor pool is allowed to percolate into the soil. Waste oil from private vehicles is primarily utilized for dust control; however there was evidence of indiscriminate oil dumping at construction company maintenance yards. As discussed previously, open burning, indiscriminate dumping, and road dusting are not considered completely acceptable oil disposal practices.

TASK 5 LAWS AND REGULATIONS

5A Review Existing Laws, Regulations, Ordinances Dealing With Hazardous Wastes

5A.1 Federal Statutes

The Federal statutes affecting management of hazardous wastes are summarized in Table 5-9 and described in Appendix C.

5A.2 Trust Territory Laws and Regulations

5A.2.1 Public Law 4C-78 (63 TTC 505 et seg.)

This law grants authority to the Trust Territory Environmental Protection Board to promulgate regulations with respect to air, land, and water pollution.

5A.2.2 Title 63, Chapter 13, Subchapter IV, Trust Territory Pesticide Regulations

This regulation prohibits the use, storage, transportation, mixing, or discarding of any pesticide or pesticide container in any manner which would adversely affect the environment.

5B Federal Hazardous Waste Program

As discussed in Appendix C, the Resource Conservation and Recovery Act of 1976 (PL94-580), Sections 3001 through 3010, requires the Federal Environmental Protection Agency to establish standards and promulgate regulations for the proper management of hazardous wastes. Because the Trust Territory Islands of the Pacific are not legally able to administer the program in lieu of a Federal program, the EPA Region IX office will be responsible for administering and enforcing the program. Table 5-10 presents an outline of the proposed Federal program.

5C Recommended Hazardous Waste Regulations

Included in the solid waste management plan being developed for the Trust Territory (Reference 29) is a model solid waste management regulation. Portions of this model dealing with hazardous wastes are presented below.

TABLE 5-9

FEDERAL STATUTES DEALING WITH HAZARDOUS WASTE MANAGEMENT*

Statute/ Administering Agency	Description
Resource Conservation and Recovery Act of 1976 (PL94-580)/Environmental Protection Agency	Places primary responsibility to regulate management of hazardous wastes on EPA.
Toxic Substances Control Act of 1976 (PL94-469)/EPA	Authorizes research and regulation of those substances found to be hazardous.
Section 112 of the Clean Air Act Amendments of 1970 (PL91/604)/EPA	Authorizes the setting of standards for hazardous air pollutants and controls the incineration of hazardous wastes.
Federal Water Pollution Control Act Amendments of 1972 (PL92-500)/ EPA	Authorizes control over toxic pollutants discharged into water from point sources, the removal of toxic pollutants from critical port and harbor areas, and a plan describing the process for the disposal of pollutants.
National Environmental Policy Act of 1969 (NEPA) (PL91-190)/Not Specified	Requires the preparation of an environmental impact statement for all Federal hazardous waste management activities.
The Occupational Safety and Health Act of 1970 (OSHA) (PL91-596)/ Department of Labor	Authorizes the setting of mandatory standards to protect people working with hazardous materials.
The Poison Prevention Packaging Act of 1970 (PL91-601)/Department of Health, Education, and Welfare	Authorizes the establishment of special packaging standards for hazardous household substances.
The Federal Hazardous Substances Labelling Act of 1960 (PL86-613)/ Department of Transportation (DOT)	Prohibits the transport of hazardous substances that have been misbranded or the labels have been removed.
Hazardous Materials Control Act of 1970 (PL91-458)/DOT	Authorizes an evaluation of the hazards associated with transporting hazardous materials.

* Reference 16.

TABLE 5-9 - (Continued)

Statute/ Administering Agency	Description
Transportation of Explosives Act (U. S. Code, Title 18, Chapter 39)/ DOT	Prohibits the unregulated transport of dangerous materials.
The Safety Regulation of Civil Aeronautics Act of 1958 (PL85-726)/Federal Aviation Administration of DOT	Authorizes FAA to develop air transportation standards to provide adequate safety.
The Hazardous Cargo Act (U. S. Code, Title 46, Chapter 7)/U. S. Coast Guard	Places controls on the water transport of dangerous substances.
The Food, Drug, and Cosmetic Act Animal Drug Amendments of 1968 (PL90-399)/Not Specified	Prohibits the misbranding of certain consumer items.
The Marine Protection Research and Sanctuaries Act of 1972 (PL92-532)/ EPA	Prohibits the transport for ocean dumping of many extremely hazardous wastes.
The Coastal Zone Management Act of 1972 (PL92-583)/Not Specified	Requires that coastal management agencies regulate hazardous waste disposal.
Section 212 of the Resource Recovery Act of 1970 (PL91-512)/EPA	Requests a study of the feasibility of a system of national hazardous waste disposal sites.
Safe Drinking Water Act of 1974 (PL93-523)/EPA	Authorizes regulation of underground injection of toxic wastes.
The Atomic Energy Act of 1954, as Amended (PL83-703)/NRC and Private Industry	Authorizes the management of radioactive wastes generated in fission reactions.
The Armed Forces Appropriation Authorization Acts of 1969 and 1979 (PL91-121; PL91-441)/Not Specified	Limits the use of Federal funds for disposal of chemical and biological warfare agents.
The Federal Environmental Pesticide Control Act of 1972 (PL92-516)/EPA	Requires the establishment of procedures and regulations for the disposal of pesticides.

TABLE 5-10

AN OUTLINE OF THE PROPOSED FEDERAL PROGRAM ON HAZARDOUS WASTE MANAGEMENT*

I. HAZARDOUS WASTE CRITERIA

A. Establishes criteria for identification of hazardous waste.

B. Establishes list of hazardous wastes which will be subject to regulation.

II. STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

A. Requires record-keeping practices that identify the quantity, composition, and disposition of hazardous waste generated.

B. Requires labelling of hazardous waste containers.

C. Requires compliance with manifest system.

D. Requires submission of reports detailing quantities generated and disposal means.

III. STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

A. Requires record-keeping concerning hazardous waste transported, including its source and delivery points.

B. Requires transportation of hazardous waste only if properly labelled and containerized.

C. Requires compliance with manifest system.

C. Requires transportation of hazardous waste only to permitted facilities.

IV. STANDARDS APPLICABLE TO OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

A. Requires record-keeping of hazardous wastes accepted and the manner in which the wastes were treated, stored, and/or disposed.

B. Requires submission of reports with respect to manifest violations, accidents, operating conditions, and monitoring.

C. Requires compliance with manifest system.

* Reference 2.

TABLE 5-10 - (Continued)

D. Requires monitoring of air and ground water/leachate and regular inspection of facility operations.

E. Establishes procedures for the proper treatment, storage, and/or disposal of hazardous wastes.

F. Establishes criteria for location, design, and construction of hazardous waste treatment, storage, and disposal facilities.

G. Requires contingency plans be established to cover accidents such as fires, explosions, spills, leaks, etc.

H. Requires all personnel to be trained by approved programs.

I. Requires facilities to be maintained.

J. Establishes criteria for ownership, continuity of operations, and financial responsibility.

K. Establishes performance criteria necessary to protect the environment and human health.

V. PERMIT SYSTEM FOR TREATMENT, STORAGE, OR DISPOSAL OF HAZARDOUS WASTE

A. Requires each owner or operator to submit specified information in the permit application to ensure that EPA can make the most efficient and expedient determination possible.

B. Mandates time limits for the application submission and review process within which both EPA and the applicant or permitter must act.

C. Establishes a compliance schedule to bring existing facilities into compliance with the act.

D. Establishes revocation procedures and circumstances.

VI. PRELIMINARY NOTIFICATION

A. Requires notification by hazardous waste handlers within 90 days of promulgations of the regulations of this act.

VII. ENFORCEMENT PROVISIONS

A. Establishes the authority of EPA to inspect facilities, copy records, and obtain samples.

TABLE 5-10 - (Continued)

VIII. COMPLIANCE PROVISIONS

A. Establishes civil and criminal penalties.

B. Establishes procedures for informing violators.

"Section I - Definitions

"G. 'Hazardous waste' means any waste or combination of wastes which pose a substantial present or potential hazard to human health or living organisms because such wastes are nondegradable or persistent in nature, or because they can be biologically magnified, or because they can be lethal, or because they may otherwise cause or tend to cause detrimental cumulative effects.

"H. 'Incineration' means the destruction of solid waste by burning in a furnace designed for the purpose wherein solid waste is essentially reduced to ash, carbon dioxide, and water vapor.

"I. 'Incinerator' means an engineered combustion device specifically designed for volume reduction, by controlled burning, of combustible solid waste.

"P. 'Pesticide' means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.

"A1. 'Treatment' means any activity or processing designed to change the physical form or chemical composition of wastes.

"Section 4. Standards for Hazardous Waste Disposal

"Each district shall be responsible to see that facilities for the disposal of hazardous waste materials are available.

"Any person desiring to dispose of hazardous waste materials shall notify the Director or his authorized district representative of the intention to do so. Such disposal shall be completed only upon authorization of the Director or his representative.

"Any solid waste facility requiring a permit under Section 2 that accepts hazardous waste materials for disposal shall dispose of such wastes in accordance with the rules and regulations of the Board and the standards of this section. The Director shall adopt and, from time to time, revise such standards as he deems necessary. Such standards and revisions shall include procedures designed to prevent damage to human health or living organisms from exposure to the hazardous wastes identified in this section.

"A. Infectious and pathological wastes generated at medical, veterinary and other facilities shall be incinerated, sterilized, or otherwise rendered safe prior to removal from these facilities for final disposal.

"B. Toxic, caustic, volatile, and flammable chemical waste may be incinerated or disposed of in a manner approved by the Director prior to final disposal. If such wastes are delivered directly to a landfill, it shall be rendered non-hazardous by chemical neutralization or stabilization prior to final disposal.

"The disposal of chemical wastes at a landfill shall be in a special trench or pit that is designed to retain the wastes and prevent infiltration into ground and surface waters. The burial area shall be clearly marked with adequate warning signs and under no circumstances will smoking or open flames be allowed when these types of wastes are being disposed of. The burial site shall be recorded in the final plan of the completed site and made a part of the legal description of the property.

"C. Dewatered sludges from water treatment plants and dewatered digested sludges from waste water treatment plants shall be mixed with the other deposited solid wastes at the landfill to prevent localized leaching. Raw sewage sludges and septic tank pumpings are prohibited at all solid waste disposal facilities."

To allow for local control of certain particularly relevant problem areas, it is recommended that the hazardous waste regulations presented above be adopted* with the following modifications and additions:

(1) Insert the following paragraph in Section 4: Any proposed new activity or modification to an existing activity which will cause the generation of hazardous wastes shall submit to the Director a hazardous waste management plan. The new or modified activity shall not commence prior to acceptance of the plan by the Director.

(2) Add the following definition to Section I: "Pathological waste incinerator" means an engineered combustion device designed in such a manner so as to allow sufficiently high temperature, dwell time, and turbulence to ensure complete sterilization of the waste material.

(3) Modify Section 4A as follows: Infectious and pathological wastes generated at medical, veterinary and other facilities shall be incinerated in a conventional pathologic waste incinerator, sterilized, or otherwise rendered safe prior to removal from facilities for disposal.

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* As well as other appropriate sections of the model, including Section 7. Variances; Section 8. Penalties; Section 9. Hearings and Appeals; Section 10. Application; Section 11. Severability Clause; and Section 12. Date of Effect.

(4) Add a Section 4D as follows: Generators of waste oil shall adopt all practical measures to reduce waste quantities and to reuse or recycle waste oil to the maximum extent possible. Where it can be demonstrated that wastage is necessary, disposal methods shall be approved by the Director. Spreading of oil on roadways, airports, and other areas for the purpose of dust control shall be initially limited to areas which preclude the possiblity of contamination of 1) potable ground water; 2) surface waters; and 3) areas under agricultural cultivation of food crops. The use of waste oil for dust control shall be prohibited three (3) years after the adoption of this order.

(5) Insert the following statement in Section 10. Application: Standards and regulations promulgated under this section shall be applicable to both governmental and non-governmental entities.

TASK 6 RECOMMENDED STRATEGY

6A Alternatives to Environmentally Unacceptable Practices

Waste handling and disposal practices identified in Task 4D as alternatives to environmentally unacceptable are presented in Table 5-11.

6B Evaluation of Alternatives

Alternatives presented in Table 5-11 are evaluated in the following sections.

6B.1 Asphaltic Oil

All leaking containers of asphaltic oil should be redrummed. This material should then be stored for future use, or sold. American Samoa might be a potential purchaser. Their Public Works Department will be conducting extensive road construction and maintenance in the near future.

6B.2 Calcium Hypochlorite

The calcium hypochlorite in storage should be tested to determine its usability. If found usable, it should be utilized at the water treatment plants. If not, disposal should occur in Enewetak* or California, and be coordinated with disposal of suspended and unusable pesticides (refer to Section 5B.6).

6B.3 Hospital Wastes

6B.3.1 Pathological Wastes

All pathological wastes should be incinerated at point of generation. The approximate cost of a new incinerator (45 kilogram/100 pound per hour capacity) for Majuro is $21,000.** Ponape and Yap should begin utilizing their new pathological incinerators immediately. Mr. Metz of Metz Engineering Company (Union Station, Portland, Oregon 97209) was contacted concerning a replacement burner for the incinerator on Truk. The order should be placed through him at the above address (previous orders were not received). The approximate replacement cost

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* The U. S. Navy is planning to conduct a cleanup campaign of the Enewetak Atoll, Marshall Islands. Radioactive material is to be buried in a crater and encapsulated with concrete. This operation may provide an opportunity for one-time disposal of the suspended and unusable pesticides currently held in storage.

** This cost includes freight, installation, and on-site training by a manufacturer's representative.

TABLE 5-11 - ALTERNATIVES TO PRESENT ENVIRONMENTALLY UNACCEPTABLE PRACTICES, TRUST TERRITORY ISLANDS OF THE PACIFIC, 1977

(SHEET 1 OF 1)

Hazardous Waste	Storage	Transport	Recovery/Reuse	Treatment	Disposal Point
Asphaltic Oil	Redrum Leaking Containers	--	Sell or Use	--	Sell or Use
Calcium Hypochlorite	Steel Drums	DOT Regulations*	Test to Determine Usability	--	Water Treatment Plant (if Usable); Hazardous Waste Landfill (if Unusable)
Hospital Wastes					
• Pathological	Plastic Bags	--	--	Incineration at Generation Point	Hospital Incinerator
• Expired Medicines	Original Containers	--	--	--	Return to Manufacturer; Hospital Incinerator; Landfill; Sewer System**
Pesticide/Chlorine Containers	Secured Area Protected from Weather	--	Refilling by Original Manufacturer	Triple-Rinsed, Punctured, Crushed	Landfill
Tank Bottom Sediments	Steel Drums	--	--	--	Landfill (Sealed Drums)
Tetraethyl Lead Sludge	Steel Drums	--	--	--	Hazardous Waste Landfill
Suspended and Unusable Pesticides	Locked Storehouse in Secured Area	DOT Regulations*	Remanufacturing	--	Hazardous Waste Landfill
Waste Oil	Drums/Tanks	--	Recovery Via Supplemental Fuel Use	Centrifugation	Lubrication Oil Supplier; Power Generating Facilities; Shipment to Guam for Refining

* U. S. Department of Transportation.

** Proper disposal requires a case by case decision.

is $600. In addition, a supplemental fuel firing system should be purchased for the District Hospital on Palau, or the incinerator replaced.

6B.3.2 Expired and Unusable Medicines

If possible, all expired and unusable medicines should be returned to manufacturers for credit. For those medicines which cannot be returned, any one of the following is acceptable practice:

- Incineration at hospital
- Separate disposal at the landfill
- Sewer system

Proper disposal requires a case-by-case decision.

6B.4 Petroleum Waste Products

6B.4.1 Tank Bottom Sediments

Tank bottom sediments disposal should be limited to island landfills. The sludge should be disposed in securely fastened steel drums, placed in a special pit, and covered. The pit area should be well marked and properly recorded on appropriate land use plans.

6B.4.2 Tetraethyl Lead Sludge

Tetraethyl lead sludge requires disposal in a hazardous waste landfill because of its toxic organic lead content.

6B.4.3 Waste Lubrication Oil

Lubricating oil, prticularly troublesome in an island environment, is reclaimable. Recovery should be given highest priority. It can be rerefined for reuse as a lubricant or utilized as a supplemental fuel oil. Reuse alternatives which are potentially feasible include:

- Installation of centrifuges at all power plants to reduce waste quantities.
- Arrangements with oil suppliers to return lubricating oil to the manufacturer for reprocessing.
- Shipment to Guam for refining.
- Use as a diesel fuel supplement at the power plant or in heavy construction equipment.

While detailed engineering studies are required to determine the optimum strategy, the first two alternatives implemented simultaneously appears to be the most cost-effective and require minimal effort on the part of local waste oil generators.

Centrifuges remove solids and water contaminants accumulating over time and permit oil to be used 10 to 50 times longer, depending on site-specific conditions. The costs for centrifuge units are as follows:

KW Capacity	Cost*
500	$ 9,000
1,000	11,000
2,000	14,000

Arrangements with petroleum product supplier for waste oil shipment off-island to suitable rerefining facilities for recovery would relieve the Trust Territories in the short term of this potentially environmentally degrading waste. Shipments of lubrication oils to the islands are made in drums. Little expense would be incurred by the local bulk supplier to replace arriving drums with drums filled with waste oil. (For every two drums arriving it is estimated only one will require return shipment; Reference 28.) Local generators would be responsible for arranging with the local supplier to transport their waste oil back to the bulk distribution plant. Union 76 is providing such a collection service for its customers in American Samoa. However, Union 76 is transporting the waste oil to the Tifuna landfill for disposal instead of shipping to a rerefining facility. In the long term, implementation of an alternative permitting local reuse of waste oil will prove very beneficial to island economies as the cost of petroleum products increases.

6B.5 Spent Pesticide and Chlorine Containers

All spent pesticide containers should be triple-rinsed, punctured, and crushed prior to burial, in accordance with U. S. Environmental Protection Agency regulations. If spent containers are stored prior to disposal, storage should be in a secured area, protected from the weather. Consideration should be given to shipping spent metal containers back to manufacturer for refilling.

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* This cost includes freight and installation.

6B.6 Suspended or Unusable Pesticides

The acceptable alternatives to pesticide disposal are:

- Shipment back to manufacturer for credit or remanufacturing
- Shipment to a California hazardous waste disposal facility

If possible, pesticides should be returned to the manufacturer for credit or remanufacturing.

If this is not possible, the pesticides should be shipped to California for disposal. Cost (if consolidated at one of the islands) of shipping and disposing of the approximately 3,700 pounds of pesticides in California would be $800 (refer to Appendix D for transportation and disposal costs). Pesticide shipment requires containerization in accordance with DOT regulations.

While awaiting disposal, these pesticides should be stored in a locked storehouse within a secured area.

6C Identification of Potential Sites for Hazardous Waste Disposal

The hydrogeologic conditions of the Trust Territory Islands of the Pacific preclude hazardous waste landfill siting without significant engineered features to protect ground water. The small quantities requiring disposal do justify considering development of a limited hazardous waste landfill for the disposal of those wastes not considered extremely hazardous. Wastes which should be considered for local hazardous waste disposal are the unusable calcium hypochlorite and tank bottom sediments (excluding tetraethyl lead sludges) and any other such wastes which may be generated from time to time. Otherwise, the calcium hypochlorite and those extremely hazardous wastes generated will require shipment off island for proper disposal.

6D Territory Strategy

The strategy tasks recommended for the Trust Territories are discussed below.

6D.1 Budget Request

Financing for items to be discussed below should be obtained through traditional budgetary means.

6D.2 Island Cleanup

Shipment to California of all stored wastes requiring disposal in a hazardous waste landfill should be made. Continued storage is regarded as a significant potential hazard.

6D.3 Hospital Incinerators

It is recommended a pathological incinerator be purchased for the District Hospital on Majuro. The repairs and modification to the existing incinerators on Truk and Palau should be made as soon as possible. It is also recommended the District Hospitals on Ponape and Yap begin utilizing their new incinerators immediately.

6D.4 Personnel Training

Training should be provided to the following island personnel:

- District Agricultural Officers in the handling and disposal of pesticide containers.
- Hospital incinerator operators in the handling and disposal methods for pathological wastes and operation and maintenance of the incinerator.
- Area sanitarians in the management of local hazardous wastes and enforcement of proposed regulations.

The estimated cost of training is $11,000 (26 days at $250 per day plus $4,500 in expenses).

6D.5 Encourage Waste Oil Utilization

The recommendation of Section 6B.4.3 provides the most expedient method of recovering waste oil (i.e., volume reduction and shipment of the remainder off island via lubrication oil supplier). However, other alternatives identified provide the potential for significant reduction in the Territory's outlays for petroleum products if waste oil can be utilized on-island. It is therefore recommended a detailed waste oil utilization study be conducted individually (perhaps as a portion of the next territorial solid waste management planning effort); or in conjunction with the other islands of the Pacific Basin in a similar situation (e.g., American Samoa and the Government of Northern Marianas).

6D.6 Solid Waste Management Regulations

To allow for control of certain particularly relevant problem areas, it is recommended the model solid waste management regulation being developed for the Trust Territory be adopted and enforced with the modifications discussed in Section 5C.

6D.7 Periodic Follow-up Contract

It is recommended a periodic follow-up contract (perhaps annually) be let to review and inspect island-by-island progress in meeting the recommendations of this study and to consult on any new problems that may arise. A status report should be made to the High Commissioner. The estimated cost if $6,000 (includes three weeks of field work plus expenses).

APPENDIX A

PROBLEM ASSESSMENT AND STRATEGY
FOR HAZARDOUS WASTE MANAGEMENT
STATE OF HAWAII
TERRITORIES OF GUAM, AMERICAN SAMOA, AND TRUST
TERRITORY ISLANDS OF THE PACIFIC (U. S.)

WORK PLAN

TASK 1 IDENTIFICATION OF CONDITIONS

A. Review and summarize hazardous waste aspects of existing solid waste management reports. Include reports for:

- Hawaiian Islands
- City and County of Honolulu
- Territory of Guam
- Trust Territory Districts (currently being developed)
- Military installations
- Others identified during course of study

B. Categorize expected types of hazardous wastes, including, but not limited to:

- Industrial
- Agricultural (primarily pesticides)
- Pathological
- Sewage and water treatment sludges
- Special chemical, biological, or radioactive wastes

C. Identify potential hazardous waste producers. Include:

- Industry
- Commerce
- Public works
- Agriculture
- Military
- Hospitals
- Universities

D. Survey (utilizing State of California "Industrial Waste Survey" form and follow-up techniques as required) identified waste producers to determine hazardous waste:

- Source
- Type
- Quantity
- Concentration
- Physical state
- Seasonal variation
- Storage methods
- Recovery
- Disposal methods
- Quantity projections

If necessary, modify "Industrial Waste Survey Form," or develop new form(s) to accommodate special cases, if any. Compile information in a statistically useful manner.

TASK 2 STORAGE

Develop survey form (or modify "Industrial Waste Survey") to determine quantities of wastes presently stored or retained from previous years. In addition to waste producers identified in Task 1C, survey:

- Waste haulers and disposal site operators
- District agricultural warehouses
- Governmental agencies

Follow up as required to maximize responses. Compile data.

TASK 3 PROJECTIONS

Based on data accumulated from surveys, existing reports, industrial growth trends, and planned development, modification, and expansion, project future hazardous waste generation patterns.

TASK 4 IDENTIFICATION AND EVALUATION OF STORAGE, PROCESSSING, AND DISPOSAL ACTIVITIES

(Note: Surveys indicated in Tasks 2 and 4 will be conducted simultaneously on a single survey form)

A. Identify hazardous waste haulers and storage, processing, recovery, and disposal site operators. Indicate location of sites.

B. Establish criteria with which to determine environmental acceptability of existing operations. Consider:

Landfill

- Safety
- Waste compatibility
- Cover requirements
- Containerization
- Regulations, ordinances, franchises

Incineration

- Existing
  - Compatibility with present operation
  - Safety
- New
  - Outline specifications
  - Estimated costs

Storage

- Container type
- Safety
- Protection from environment
- Length of time

Transport

- Container type
- Safety
- Handling/loading
- Transportation vehicles
- Unloading

C. Survey identified storage, processing, and disposal operations. Collect data to allow evaluation of operations in light of criteria developed above.

D. Evaluate data collected above and determine degree of compliance with criteria. Identify operations which are environmentally unacceptable.

TASK 5 LAWS AND REGULATIONS

A. Review existing laws, regulations, ordinances, etc., dealing with hazardous waste:

- Storage, processing, and disposal responsibility
- Operation standards
- Monitoring
- Enforcement
- Permits
- New facility siting

B. Recommend amendments to existing laws and regulations and new legislation as required.

TASK 6 RECOMMEND STRATEGY

A. For wastes identified in Task 4D as being disposed of in an unacceptable manner, consider the following alternatives where appropriate:

Storage

- Container type
- Safety
- Protection from weather
- Waste mixing compatibility
- Residence time

Transport

- Shipping containers
- Safety
- Handling (loading and unloading)
- Vehicles

Recovery/Reuse

- In-plant modifications
- Waste product exchange
- Potentially marketable products

Neutralization

- Operation (required facilities and chemicals)
- Costs

Landfill

- Siting
- Ground water protection
- Soil type
- Waste compatibility
- Cover requirements
- Containerization

Incineration

- Existing
    - Compatibility of present operation
    - Safety
- New
    - Outline specifications
    - Estimated cost

B. Evaluate appropriate alternatives on a case-by-case basis and recommend optimum method. Establish costs.

C. Identify potential sites for the operations recommended in Task 6B.

D. Develop master plan strategy for coordinating the proper handling of hazardous wastes in the Pacific Basin. Review previously developed criteria, regulations, and recommendations in light of a regional perspective. Develop cooperative concepts for interstate and inter-territory hazardous waste handling. Develop critical path scheduling and cost estimates for implementing recommended systems.

E. Establish surveillance and monitoring requirements for all phases of hazardous waste handling.

TASK 7 REPORTS

A. Prepare "Detailed Plan of Work and Milestones."

B. Prepare monthly progress reports in letter form. Summarize progress to date, problems encountered, and anticipated solutions. Outline anticipated activities during next month's reporting period. Indicate percent completion of project.

C. Make oral presentations (up to three) at designated times and locations.

D. Prepare draft outline of the final handbook(s). Include:

- Summary
- Project objectives
- Methodology

- Assumptions
- Major calculations (in appendix)
- Recommendations
- Conclusions

E. Prepare draft handbook(s). Include draft texts of each task outlined in Work Plan.

F. Revise draft handbook(s) as required to produce approved final report. Submit for approval. Print and distribute 500 copies as designated.

APPENDIX B

EVALUATION CRITERIA

Based on a thorough literature search and past experience, the following criteria are established to delineate minimum acceptable characteristics of certain hazardous waste management practices.

B1 Landfill (References 30, 31, 32, 33, 13, and 34)

- Geology/hydrology: Geologic conditions are naturally capable of preventing hydraulic continuity between liquids and gases emanating from the waste in the site and usable surface or ground waters, or the disposal site has been modified to achieve such capability. Soil should have high clay content due to the low permeability and beneficial adsorptive properties of such soils.

- Topography: Topography must be such that the site will not be subject to excessive runoff or flooding. Slope of site must not be so steep as to allow instability of the filled material. Sites should be located away from flood plains, natural depressions, and excessive slopes.

- Location: Site should be located in an area of low population density, low alternative land use value, and an adequate distance from existing or planned water supplies. Whenever possible sites should have low rainfall and high evaporation rates. Sufficient cover material must be available. Site should be located as close as possible to the majority of waste generators.

- Design: Site should be designed to prevent or contain any significant predictable leachate or runoff. Site should be fenced or otherwise guarded to prevent public access. Monitoring wells should be established.

- Operation: Incompatible wastes must be separated. Records should be kept of the locations of various hazardous waste types within the landfill. Monitoring wells should be tested periodically.

- Safety: All operations must be conducted in such a manner as to minimize danger to human and animal life. Site personnel should be thoroughly trained in appropriate operating techniques, first aid, emergency procedures, etc., and outfitted with adequate safety equipment.

B2 Incineration (References 31, 32, 13, 34, 35, 36, 37, and 38)

- Capacity: Incinerator must have sufficient capacity to consume all required waste material. Ample area around the incinerator for charging, storing, ash handling, and general maintenance shall be provided.

- Furnace design: Furnace volume must be large enough to provide retention time needed for complete combustion. Furnace proportions must be such that ignition temperatures are maintained and fly ash entrainment is minimized.

- Primary burner design: Primary burners shall be adequate to maintain a temperature of 1,500°F. The temperature shall be pyrometrically controlled. Burner capacity for hazardous waste incinerator must be determined by analysis of waste to be burned. Air and fuel must be in proper proportion and adequately mixed.

- Secondary burner design: Secondary burners shall be adequate to maintain a temperature of at least 1,600°F. The chamber temperature shall be pyrometrically controlled and the burner should be located so the combustion gases are thoroughly mixed with secondary air prior to going through the burner flame.

- Draft requirements: Fans and intake openings should be sized to provide sufficient draft.

- Emission control equipment requirements: Proper emission control equipment shall be provided to meet prevailing air pollution regulations.

- Safety: All operations must be conducted in such a manner as to minimize danger to human and animal life. Site personnel should be thoroughly trained in appropriate operation techniques, first aid, emergency procedures, etc., and outfitted with adequate safety equipment.

B3 Storage (References 2, 3, and 6)

- Container: Container type and material shall be suitable to prevent leaking of waste material. Containers should be clearly labelled and sealed to prevent spillage.

- Storage area: Storage area shall provide protection from the weather and be adequately ventilated. Storage area should be fenced, locked, or in some other manner protected from public access, and clearly labelled as a hazardous waste storage area.

B4 Transport (References 31, 32, and 34)

- Container type: Container type and material shall be sufficiently durable to prevent leaking during handling, loading, and transport. Containers should be clearly labelled and sealed to prevent spillage.

- Handling: Loading and unloading of hazardous wastes shall be carefully executed in a manner which avoidsdamaging of containers and/or spillage.

- Transport vehicles: Appropriate vehicles shall be used to transport the hazardous wastes. Special liners, pressure relief valves, etc., shall be used as necessary.

- Safety: Transport vehicle operators must be informed of the type of waste they are hauling. They should be thoroughly trained in first aid and emergency procedures, and equipped with appropriate safety equipment.

APPENDIX C

FEDERAL STATUES*

C1 Resource Conservation and Recovery Act of 1976 (PL94-580)

This act deals with most aspects of hazardous waste management, including generation, packaging, transportation, and disposal of hazardous wastes. Section 3001 directs the EPA, by April 1978, to identify which wastes are hazardous and in what quantities, qualities, concentrations, and forms disposal they become a threat to health or the environment. The govern of any state may also petition to have any substance so listed and the administrator is then given 90 days in which to act on this petition. Sections 3002 and 3003 require EPA to issue standards for generators and transporters of hazardous wastes respecting record-keeping, practices, labelling, appropriate containers, use of a manifest system, and reporting of quantities and disposition. Substances listed by both the administrator and the Secretary of Transportation must be consistent with the requirements of the Hazardous Materials Transportation Act.

Most importantly, Section 3005 requires persons owning or operating facilities for the treatment and storage of hazardous waste to obtain permits within 90 days after identification and listing. Permit applications must indicate composition, quantities, the rate at which such wastes are to be disposed of, and the location of the disposal site. EPA or states (in jurisdictions having hazardous waste programs) may revoke permits of nonconforming users. Interim authorization is granted to anyone who has applied for a permit.

By April 1978, EPA must publish, according to Section 3006, guidelines to enable the states to develop approved hazardous waste programs. States with existing programs may receive interim authorization upon a showing that their programs are substantially equivalent to the Federal program (this temporary authorization lasts for two years). The EPA may withdraw authorization within 90 days of notice of nonconformities.

In order for EPA and state officials to enforce these requirements, Section 3007 authorizes them to inspect facilities, copy records, and obtain samples (information obtained will then be made public).

Compliance provisions of the law will be enforced through civil and criminal penalties specified in Sections 3008 and 3009. Civil actions will be commenced in Federal courts for violations extending beyond 30 days for notification, and violators will carry liability for a penalty of $25,000 for each day of continued noncompliance. Criminal penalties may be imposed on persons transporting hazardous wastes without a permit or making falsifications in labelling and reporting. Penalties of $25,000 per day or imprisonment for not more than one year authorized. States may not provide for penalties less than those provided under the bill.

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* Reference 16.

Section 3011 authorizes $25,000,000 for both Fiscal Years 1978 and 1979 to the states to implement these hazardous waste provisions.

C2 Toxic Substances Control Act of 1976 (PL94-469)

The act requires adequate data to "be developed with respect to the effect of chemical substances and mixture on health and the environment" by "those who manufacture and those who process such chemical substances and mixtures." It also authorizes EPA to regulate "chemical substances and mixtures which present an unreasonable risk of injury to health or the environment" and the taking of action "with respect to chemical substances and mixtures which are imminent hazards" before they become wastes.

C3 Section 112 of the Clean Air Act Amendments of 1970 (PL91-604)

The act authorizes the admministrator of EPA to set standards for hazardous air pollutants at any level "which in his judgement provides an ample margin of safety to protect the public health." Hazardous air pollutants are defined as those which "may cause, or contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible, illness." Asbestos, beryllium, and mercury are three hazardous pollutants for which emission limits have been promulgated. The control strategy is to protect the public health and welfare by placing the burden of standards compliance on the air polluter. The standards are based on health effects as well as environmental, social, economic, and other pertinent factors. The act also controls the incineration of hazardous wastes.

C4 The Federal Water Pollution Control Act Amendments of 1972 (PL92-500)

This act provides extensive control over the disposal or discharging of certain hazardous wastes in water.

Section 115 of the act directs EPA to locate and contract for the "removal and appropriate disposal of in-place toxic pollutant materials from critical port and harbor areas."

Section 502 defines "toxic pollutant" as "those pollutants...which...after discharge and upon exposure, ingestions, inhalation, or assimilation into any organism...will cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions...or physical deformations on such organisms or their offspring."

Four sections of Title III of the act contain provisions authorizing control over toxic pollutants discharged into water from point sources. It appears that, unless a waste disposal facility discharges toxic pollutants into a waterway through a "discernable, discrete conveyance" such as an outfall pipe, it will be exempt from the act's provisions. Hazardous waste treatment facilities should not be exempt, however.

Section 301(f) prohibits the "discharge of any radiological, chemical, or biological warfare agent, or high level radioactive waste into the navigable waters."

Section 306 requires EPA to publish national standards of performance for new point source categories reflecting "the greatest degree of effluent reduction achievable..., including, where practicable, a standard permitting no discharge of pollutants."

Section 307 requires EPA to identify and publish effluent standards for a list of toxic pollutants or combinations of such pollutants. Standards are to be set "at that level which the Administration determines provides an ample margin of safety."

Section 311 is designed to protect the navigable waters and adjoining shorelines of the United States and the waters of the contiguous zone from "hazardous substance" discharges. Designed primarily to control spills from vessels and onshore or offshore facilities, Section 311 requires violators to pay a fixed cost for each hazardous substance unit unlawfully discharged.

Section 208(b) requires areawide waste treatment management plans to be prepared and include "...(J) a processs to control the disposition of all residual waste generated in such area which would affect water quality, and (K) a process to control the disposal of pollutants on land or in subsurface excavation within such area to protect ground and surface water quality."

C5 National Environmental Policy Act of 1969 (NEPA) (PL91-190)

Section 101(b) of NEPA requires the Federal government to "use all practicable means" to attain the widest range of beneficial uses without degrading the environment or risking health or safety. In order to ensure that the environmental policies expressed in Section 101 are effectively carried out, Section 102(2)(C) requires all agencies of the Federal government to prepare detailed environmental impact statements for all "major Federal actions significantly affecting the quality of the human environment." All Federal hazardous waste management activities thus clearly fall under NEPA's jurisdiction.

C6 The Occupational Safety and Health Act of 1970 (OSHA) (PL91-596)

This act authorizes the Department of Labor to set mandatory standards to protect the occupational safety and health of all employers and employees of businesses engaged in interstate commerce. Section 6(b)(5) deals specifically with toxic materials and other harmful agents, requiring the Secretary to "set the standard which most adequately assures...that no employee will suffer material impairment of health or financial capacity" from regular exposure to such hazards. Employees of hazardous waste generators and treatment and disposal facilities engaged in interstate commerce thus are clearly entitled to the act's protection. Standards issued under the act can directly impact some phases of hazardous waste management. For example, the OSHA-enforced asbestos regulation requires that certain wastes be packaged for disposal.

C7 The Poison Prevention Packaging Act of 1970 (PL91-601)

This act authorizes the Department of Health, Education, and Welfare to establish special packaging standards for hazardous household substances whenever it can be shown that serious personal injury or illness to children can result from handling, using, or ingesting such substances. Hazardous household substances already identified in regulations include oven cleaners, cigarette and charcoal lighter fluids, liquids containing turpentine and methyl alcohol, and economic poisons (pesticides).

C8 The Federal Hazardous Substances Labelling Act of 1960 (PL86-613)

This act authorizes the Department of Transportation to identify hazardous substances and prohibit the transport of such substances if their containers have been misbranded or the labels have been removed. The act also authorizes the seizure of misbranded hazardous substances and requires the courts to direct the ultimate disposition of such seized substances.

C9 The Hazardous Materials Control Act of 1970 (PL91-458)

This act authorizes the Department of Transportation to evaluate hazards associated with hazardous materials transport, establish a central accident reporting system, and recommend improved hazardous material transport controls.

C10 The Transportation of Explosives Act (U. S. Code, Title 18, Chapter 39)

This act prohibits the knowing unregulated transport of explosives, radioactive materials, etiologic (disease-causing) agents, and other dangerous articles in interstate commerce unless the public interest requires expedited movement or such transport involves "no appreciable danger to persons or property." The Department of Transportation administers this act.

C11 The Safety Regulation of Civil Aeronautics Act of 1958 (PL85-726)

This act authorizes the Federal Aviation Administration of DOT to establish air transportation standards "necessary to provide adequately for national security and safety in air commerce."

C12 The Hazardous Cargo Act (U. S. Code, Title 46, Chapter 7)

This act places regulatory controls on the water transport of explosives or dangerous substances, authorizing the U. S. Coast Guard to publish regulations on packing, marking, labelling, and containerization of such substances.

C13 The Food, Drug, and Cosmetic Act Animal Drug Amendments of 1968 (PL90-399)

This act prohibits the adulteration and misbranding of certain consumer items and requires the disposal by destruction or sale of any items seized under the act.

C14 The Marine Protection, Research, and Sanctuaries Act of 1972 (P192-532)

This act prohibits the transport from the United States for the purpose of ocean dumping any radiological, chemical, or biological warfare agents, high level radioactive wastes, or (except as authorized by Federal permit) any other material. In granting permits for ocean dumping, the EPA administrator must consider "appropriate locations and methods of disposal or recycling, including land-based alternatives, and the probable impact of such use upon considerations affecting the public interest."

C15 The Coastal Zone Management Act of 1972 (PL92-583)

In declaring it national policy to preserve and protect the resources of the nation's coastal zone, this act recognizes waste disposal as a "competing demand" on coastal zone lands which has caused "serious environmental losses." Because applicants for Federal coastal zone management grants must define "permissible land and water uses within the coastal zone," an applicant's failure to regulate hazardous waste disposal within such area so that it qualifies as a "permissible use" can serve as a basis for denying program funds under the act.

C16 Section 212 of the Resource Recovery Act of 1970 (PL91-512)

This act requires EPA to study the feasibility of a system of national disposal sites for hazardous wastes. The act authorizes no regulatory activities, however.

C17 Safe Drinking Water Act of 1974 (PL93-523)

Sections 1421 through 1424 authorize EPA to regulate underground injection to protect underground sources of drinking water.

C18 The Atomic Energy Act of 1954, as Amended (PL83-703)

This act authorizes both AEC (now NRC) and private industry to manage radioactive wastes generated in fission reactions.

C19 The Armed Forces Appropriation Authorization Acts of 1969 and 1970 (PL91-121; PL91-441)

These acts prohibit the use of Federal funds for the transportation, open-air testing, or disposal of any lethal chemical or biological warfare agent in the United States except under certain conditions requiring prior determination of the effect on national security, hazards to public health and safety, and practicability of detoxification prior to disposal.

C20 The Federal Environmental Pesticide Control Act of 1972 (PL92-516)

This act requires EPA to establish procedures and regulations for the disposal or storage of packages, containers, and excess amounts of pesticides. EPA is also required to "accept at convenient locations for safe disposal" those pesticides whose registration is suspended to prevent an imminent hazard and later cancelled if the pesticide owner so requests.

APPENDIX D

COSTS TO TRANSPORT AND DISPOSE OF HAZARDOUS WASTES IN CALIFORNIA

TRANSPORTATION COST

Point of Origin	Destination	
	California	
Oahu/Hawaii/Kauai/Maui	$ 78*	($ 38)**
Guam	264	(76)
American Samoa	157	(63)
	Guam	
Saipan	$ 77	($ 35)
Truk/Ponape	102	(44)
Yap/Pulau	110	(55)
	Honolulu	
Guam	$264	($ 75)
Majuro	301	(56)

* Charge per 40 cubic feet or 2,000 pounds, whichever is greater.

** Minimum chage for small quantity shipment.

NOTE: The cost of waste shipped from Northern Marianas or Trust Territories to California is the combined cost of shipment to Guam and Guam to California.

CALIFORNIA DISPOSAL COSTS

(1) Los Angeles - Cost Per Ton - $4.10

Los Angeles County Sanitation District
Post Office Box 4998
Whittier, California 90607

Attention: Mr. K. Burger

Telephone: (213) 699-7411

(2) San Francisco Bay Area - Cost Per Ton - $28.10

Pacific Disposal Systems, Inc.
4575 Pacheco Boulevard
Martinez, California 94553

Attention: Mr. J. Allen

Telephone (415) 228-5100

(3) Dock Loading and Transport to Site - Cost Per 25 Tons - $400.00;
Minimum Charge - $50.00

CALIFORNIA DISPOSAL REQUIREMENTS

(1) A permit must be obtained from the local office of the California Department of Health, Hazardous Materials Section, for the disposal of extremely hazardous wastes.*

1449 West Temple Street
Los Angeles, California 90026

Attention: Mr. E. Margin Tan

2151 Berkeley Way
Berkeley, California 94704

Attention: Mr. R. Stevens

(2) A California Hazardous Waste Manifest Form should be obtained through the California Department of Health prior to any shipment. The form should be filled out by the disposing government and shipped with the waste requiring disposal.

(3) Those generators desiring disposal of suspended or unusable pesticides in California must first obtain a letter of authorization from the U. S. Environmental Protection Agency, Pesticide Branch, Region IX.

(4) Disposal facility operators require one week pre-notification of impending shipments of large quantities.

(5) Wastes must be containerized to meet Department of Transportation specifications, if applicable, contain no leaks, and be secured to pallets.

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* As defined by the State of California.

APPENDIX E

E. MILITARY HAZARDOUS WASTE MANAGEMENT PRACTICES

E1 STATE OF HAWAII (Reference 39)

General Performance

In light of the present status of Federal, State, and local legislation governing the disposal of hazardous/toxic waste materials, the current practices found throughout the military vary in their compliance with standards. In a descending order of magnitude, the bulk of the reported wastes are petroleum products, detergents, photographic/printing solutions, acids and caustics, solvent, and alkalies. Other categories of reported wastes represent only a small fraction in comparison to the volume of wastes mentioned above. Based upon the reported volumes and modes of disposal, the estimated percentages of the bulk of wastes considered to be adequately disposed of are tabulated as follows:

Category of Wastes	Annual Volume or Weight	Adequate in Disposal Efficiency (%)
Petroleum Products	6,400,000 gallons	99 (volume)
Detergents	108,000 pounds 57,000 gallons	95 (weight) 65 (volume)
Photographic/Printing Solutions	192,000 gallons	99 (volume)
Acids/Caustics	117,000 gallons 310 pounds	71 (volume)
Solvents	96,000 gallons	60 (volume)
Alkalies	6,000 gallons 684 pounds	55 (volume)

From a quantitative point of view, a greater proportion of the aggregate wastes, in reference to above, are presently disposed of adequately. Other categories of wastes, minor in volume by comparison, exhibit a similar profile in disposal adequacy. Significantly, the bulk of the overall inappropriately disposed wastes could be effectively dealt with by existing facilities or services available for treatment or final disposal. Other wastes, minor in quantity, require case-by-case attention for devising measures suitable for their treatment and disposal.

E1.3 Findings by Services

A significant difference exists in the volume of waste produced between one military branch and another. As shown in the statistical summary, the aggregate volume of wastes reported by the Marine Corps represents only a minute fraction in comparison to the wastes generated by the Navy. However, the great difference in volume of waste production does not appear to influence the efficiencies of proper waste disposal. The findings pertaining to each military establishment are discussed individually below.

A. Navy

The largest volume of wastes is generated by Navy operations. Petroleum products account for the largest single category of wastes reported (over 6,300,000 gallons annually). The Naval Supply Center, Pearl Harbor, Oil Reclamation/Recycling Facility and private contract services are currently responsible for the disposal of petroleum wastes.

Reclamation/recycling of petroleum wastes represents an economic asset from a resource standpoint and the large volume warrants recycling. The success of maximum recycling depends on proper segregation. Currently, the Navy oil reclamation facility processes only high flash (greater than or equal to 140°F. flash point) oily wastes. The reclaimed oils are burned in water and fire tube boilers for heating purposes. The low flash oily wastes are disposed of by a private contractor using high temperature incineration. (This contract service is available to all services.)

The Navy operated industrial waste treatment plant has not been fully utilized (for acids, alkalies, cyanide, and chromium wastes). Acids and particularly alkalies are in some cases reported to be disposed of in a manner which is in violation of Public Law 92-500. Assessment of the Navy plant indicates that its capacity is adequate to meet the specific waste volume generated by the joint military on Oahu. The pertinent transport logistics and contract agreement should be explored between the armed services in order to utilize this facility at full scale. The disposal of chromium solutions is the only case in which the activities utilize the facility to the proper degree necessary.

The discharge of solvents into storm drains was a reported practice at certain Naval activities. A substantial volume of solvent wastes was also reported to be disposed on land surface as a means of dust control. Deterioration of land and water resources could result from such methods of disposal. Enforcement of instructions necessitate the incineration of solvents by either Public Works Center, Pearl Harbor, or private contract services. The disposal of infectious medical waste (pathological wastes) relies exclusively on landfill.

This method of disposal is acceptable provided the wastes are first subjected to sterilization, incineration, or rendered safe prior to landfill. Otherwise, the direct burial of these wastes in landfill constitutes a violation of the State Public Health Standards. A large proportion of oxidizers and reducers, and miscellaneous wastes are reported to be disposed of in a manner which is in direct conflict with regulation. These categories of wastes require case-by-case study of the industrial constituents and their associated modes of disposal. Photographic waste solutions are invariably discharged into sanitary sewer systems. This problem will be examined in the discussion pertaining to the Air Force.

B. Army

The reported disposal modes for petroleum products, infectious medical wastes and explosives are generally adequate. However, some small quantities of acids and alkalies are reported to have been discharged into storm and sanitary sewers. These wastes should be redirected to the Navy operated industrial plant to assure adequate disposal. The dependency upon sanitary sewers for the disposal of strong oxidizers and reducers, disinfectants, photographic solutions, and miscellaneous wastes requires careful evaluation. As evident in Appendix 4, many of the listed sub-categories of waste within this group are well assimilated by treatment processes; other constituents, however, discharged in such a manner, require correction. A portion of the solvent wastes are disposed of on ground and such disposal should be eliminated.

C. Air Force

Photographic and infectious medical wastes comprise the largest volume of wastes generated by the Air Force. An in-house study was recently conducted by the Fifteenth Air Base Wing (ABW) Environmental Health Service to ascertain the appropriate disposal methods for photo chemicals. Based on methods recommended by both industry and Air Force guidance (see References 16 and 17), photographic chemicals require pre-treatment prior to discharge into sanitary sewer systems. The prescribed pre-treatment methods consist of: (1) recovery of silver from fixer solutions; and (2) adequate dilution of the remaining photo chemicals. The Air Force has undertaken enforcement of the above recommendations in all of its photographic processing facilities. Similar investigation and enforcement should be applied by the other armed services.

The Air Force relies exclusively on landfill as a final means of disposal of infectious medical wastes. Sterilization procedures are applied to infectious medical wastes before disposal in compliance with standard medical procedures. Six thousand (6,000) items of bacteriological culture wastes were reported by the Air Force as part of its biological and pathological waste category. These wastes are sterilized prior to leaving the facilities.

The reported petroleum products and solvents are by and large disposed of in accordance with instructions. Acid and alkali wastes require redirection from their present methods of disposal.

D. Marine Corps

According to reported quantities, the Marine Corps presently generates the smallest volume of wastes. The reported infectious medical wastes constitute the largest category of wastes in terms of numerical value. The disposition of such wastes is discussed in the previous section dealing with Air Force. The Marine Corps reliance on ground disposal of its oil and solvent wastes is being remedied to protect the environment. Several disposal modes reported for acid wastes are unacceptable. Alternative methods such as pre-treatment at the Navy industrial treatment plant should be considered for final disposal.

The reported value of 1,630,000 gallons shown under the miscellaneous category consists of steam plant blowdown, pool filter backwash, and engine test cell. The Marine Corps currently possesses the necessary permits from EPA that allow such discharge of these types of effluent. Similar effluent discharges were not included in this study by other services, but have been addresssed. The other reported values of waste classified as miscellaneous require further investigation pertaining to the precise nature of these wastes.

Discussion on Correction

The following discussion will place emphasis on those hazardous/toxic wastes that are in violation of policy, regulations, or standards. It involves: (1) wastes which only require procedural changes from their present means of handling and disposal; (2) wastes which require further study and investigation for their proper management; and (3) wastes that are currently unmanageable locally.

A. Wastes Requiring Only Procedural Changes of Disposal/Treatment Methods

Although there are existing treatment facilities designed specifically to treat certain types of acids, alkalies, bases, cyanides, and chromium wastes, many activities were discharging these wastes into sanitary sewers and storm drains. Such practices were reported throughout all the military branches. Personnel involved in such practices may or may not be aware that this is in violation of regulations. The continued use of these methods is due partly to its inherent convenience, as well as to the lack of proper storage facilities in some activities, and to the lack of knowledge regarding the systematic collection procedures on the part of the responsible personnel. In addition, the private contract services available for disposing of volatile wastes, such as solvent and contaminated petroleum products, are not fully utilized. The conditions under which such failure occurs can be attributed to the same reasons as those wastes with available treatment and disposal facilities. Since treatment facilities and special services are available, the bulk of the wastes presently discharged into sanitary or storm drains and on land could be reduced to a minimum.

In view of the discussion, the success of maximum utilization of the available facilities depends largely on management and the competence of the personnel involved. It is a necessity that all personnel be fully aware of the regulations and instructions pertaining to the proper procedures of disposal. The need to educate and inform personnel cannot be under-emphasized.

B. Wastes Requiring New Disposal Practices

The existing treatment facilities and hardware are limited in function to treat those materials specifically intended by their original design. An array of materials ranging in degree and toxicity remain improperly handled and disposed. However, the overall quantity of the inventory waste products belonging in this group is relatively small. A partial list of the individual chemicals and materials is shown in Appendix 6* and tabulated according to the specific hazards as stated in the Naval Consolidated Hazardous Items List (CHIL). As reflected in the inventory, the specific type of waste and its current disposal mode are often found incongruous with one another. Many of these practices are obviously in violation of regulations (primarily improper discharge into storm or sanitary drains). Some of these wastes, including incidental wastes (cleansing agents, etc.), require further investigation regarding their appropriateness in their present modes of disposal.

Lack of concern and coordination seem to be the major factors responsible for the present situation. Materials lacking in suitable treatment are often rejected by the collection agencies. At times materials which are accepted by the collection agencies, are mixed with other hazardous materials which go through undetected. A segment of these wastes is also comingled with solid wastes and disposed of via the sanitary landfill system. In some instances, conscientious personnel having to dispose of such wastes simply store these materials. Yet, unless specific instruction can be rendered appropriately for their disposition, these stored materials will in time be inappropriately disposed of via the usual improper channels. A great portion of the materials listed in Appendix 6 could be effectively pre-treated and disposed by the methods recommended in the CHIL. However, in many cases, the practical consultation of the CHIL recommended procedures requires competent personnel along with proper facilities.

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* A modified list of these chemicals and materials and their quantities is presented in Table 7 of this report.

C. Wastes Currently Unmanageable Locally

These wastes include mercury wastes, Otto fuel, ammunition, sand blasting abrasives containing organotin,* and pesticides such as DDT and sodium arsenite. Otto fuel contaminated wastes were recently taken off this list because of the successful installation of a new incinerator for the MK48 Torpedo Program.

Some of these wastes can be rendered safe by specific treatment/process but facilities are not yet available locally or are not feasible to construct. A special incinerator is planned to dispose of small arms ammunition. These wastes, like the pesticides, are currently being stored for lack of adequate disposal.

Facilities for the proper disposal of such wastes as mercury and organotin can be provided but are costly and require skilled personnel and therefore are considered unfeasible under current circumstances.

Storage or shipment to other suitable locations therefore appears to be the only viable solution for these wastes at the present time. A hazardous/toxic material landfill if established would eliminate most of the problems and violations, some of which are probably still unknown to the study group.

Such a landfill, under the California Landfill Classification System, is in the Class I category (the California Landfill categories are referred to in the CHIL, Reference 6), and will accept most types of hazardous/toxic wastes.

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* Organic tin compounds.

E2 Guam Naval Facilities (Reference 41)

A survey of hazardous waste management practices on Guam Naval facilities was conducted by military personnel and is presented in Table E-1. Potentially hazardous wastes were identified by using draft EPA regulations. Military personnel reported that many of the wastes generated may not be declared by the Navy under preliminary notification sections of PL94-580, since these wastes are being recycled or reused and no material is discarded. It was also reported that generation rates should remain relatively constant, unless the Department of Defense decides to change the level of activity.

The following practices are considered environmentally unacceptable:

- Discharging plating wastes to a formerly dry well, seep
- Dumping battery acid on the ground
- Disposing of caustics to a dry well
- Discharge of dilute photo chemicals to storm drains
- Disposing of thinners and solvents at a landfill

Possible alternatives include: (1) neutralization of acids and caustics followed by disposal to the sewer system provided no toxic substances are formed; (2) the recovery of silver from the dilute photo chemicals; (3) prior to discharge to the sewer system, incineration of thinners and solvents at the Piti power plant; and (4) disposal of plating wastes at a hazardous waste landfill.

E2.1 Air Force Facilities

Anderson Air Force Base, Guam, was requested to submit information on hazardous waste management practices. According to Air Force personnel, this information could not be made available during the study period. However, they did report that information would be forthcoming within a few months of the study completion. When received, this information will be transmitted to Guam EPA. Approximate transmittal date is June 1978.

E3 KWAJALEIN MISSILE RANGE (References 41 and 42)

The Ballistic Missile Defense Systems Command reported the Kwajalein Missile Range (KMR) does not generate hazardous waste in quantities to be harmful to the environment. Hazardous materials are purchased to do a specific job and there is no excess. KMR is currently storing 665 liters (175 gallons) of transformer oil containing polychlorinated biphenyls (PCB's) in a warehouse in an area that contains a berm. Disposition should be in accordance with EPA regulations.

There is no excess generated in the insecticides used at KMR. The containers used for storing the insecticides are rinsed with water and solution from the rinsing is used in pesticide control. The containers are punched full of holes, flattened, and taken to the landfill area for disposal. These procedures (provided the containers are triple-rinsed) are in accordance with EPA recommendations.

KMR reported discharging 44,000 liters (11,600 gallons) of photographic/printing materials annually directly to the ocean at a point where the current will take the solution away from the Atoll. This discharge point is planned to be cleaned up when Congress approves the Sewage Treatment Project for KMR, hopefully in the Fiscal Year 1979 MCA program.

Approximately 68,400 liters (18,000 gallons) of waste petroleum products were reported incinerated in 1977. Waste products included aviation lube oil, diesel oil, motor oil, and tank cleanings. While incineration of these wastes is a generally accepted practice, lack of data regarding the incinerator (e.g., operating temperatures) precludes an environmental evaluation of this practice.

An undetermined amount of hospital wastes was reported incinerated. No information was provided on the hospital incinerator operation.

KMR reported generating approximately 57,000 liters (15,000 gallons) of bilge water. While present management practices were not reported, it is recommended that the bilge water be processed through an API separator for oil recovery if such recovery is not already occurring.

Approximately 10.8 metric tons (12 English tons) of paint-contaminated blasting sand was reported generated annually. Present management practices were not reported. These wastes require disposal at a hazardous waste landfill.

KMR should be encouraged to incorporate silver recovery prior to discharge.

TABLE E-1 - HAZARDOUS WASTE SURVEY - GUAM NAVAL FACILITIES (SHEET 1 OF 2)

Hazard	Waste Material/(Unit)	Annual Volume Metric/English	Volume Metric/English	Storage Method	Location	Treatment	Final Disposal
3	Tissue (Liters/Gallons)	30/8	3.8/1	Plastic Bag	Pathology	Isolation	Incineration at Guam Hospital
3	Solid Wastes (Kilograms/Pounds)	227/500	7/15	Plastic Bag	Operating Room	Isolation	NAVSTA Sanitary Landfill
5	Waste Medicines (Kilograms/Pounds)	5.4/12	0	—	--	Crush	Sanitary Sewer
5	Powdered Arsenic (Kilograms/Pounds)	0	1/2	Locker	Pharmacy	--	Recommend ship to CONUS
3	Hepititus Patients' Wastes (Kilograms/Pounds)	3,630/8,000	0	--	--	Isolation	NAVSTA Sanitary Landfill
5	Embalming Fluid (Liters/Gallons	114/30	0	—	—	Dilution	Sanitary Sewer
5	Photographic Wastes, Dilute (Liters/Gallons)	3,785/1,000	0	--	--	Silver Recovery	Sanitary Sewer
1	Excess Paint (Liters/Gallons)	0	1,136/300 Gallons	Lockers	Sign Shop	--	Recommend Return to DPDO
5	Oil, Water, Solvents (Liters/Gallons)	290,000/76,500	28,000/7,500	Barge, Donuts	Tug Basin	Donuts	Recycle at GORCO
5	Motor Oil, Lube Oil, Solvents (Liters/Gallons)	76,000/20,000	19,000/5,000	5,000 Gallon Tank	--	--	Returned to NSD
3,5	Septic Tank Sludge, Cooking Grease (Liters/Gallons)	1,575,000/ 416,000	0	--	--	--	NAVSTA STP Digester
5	Transformer Oils, Mineral (Liters/Gallons)	7,570/2,000	19,000/500	500 Gallon Sump	--	--	Returned to NSD
1	Paint Thinners (Liters/Gallons)	2,270/600	0	--	—	--	Evaporation
5	PCB Fluid (Liters/Gallons)	0	1,665/440 Gallons	55 Gallon Drums	--	--	Recommend ship to CONUS
5	PCB Contaminated Dirt	0	3.8/1	55 Gallon Drums	--	--	Recommend ship to CONUS
5	PCB Contaminated Piping	0	3.8/1	55 Gallon Drums	--	--	Recommend ship to CONUS
5	PCB Filter and Hoses	0	3.8/1	--	--	--	Recommend ship to CONUS
5	PCB Pontoon Tank	0	3.8/1	--	—	--	Recommend ship to CONUS
1,5	Solvents (Liters/Gallons)	4,540/1,200	0	--	--	--	Incineration at Piti Power Plant
5	Defective One-Ton Chlorine Tanks	3.8/1	0	--	--	--	Neutralized in Caustic Solution

TABLE E-1 - HAZARDOUS WASTE SURVEY - GUAM NAVAL FACILITIES (SHEET 2 OF 2)

Hazard	Waste Material/(Unit)	Volume Metric/English	Storage Volume Metric/English	Storage Method	Location	Treatment	Final Disposal
1,5	Waste Oils, Solvents (Liters/Gallons)	/400-600	/5,000 bbl	Tank	Fuel Farm	--	Recycled by GORCO
1,5	Mixed Oils, Solvents, Greases (Liters/Gallons)	6,813/1,800	751/200 Gallons	Bowser, Drums	Near Bldg. 21	--	Viz NAVSTA to GORCO
5	Asbestos (Kilograms/Pounds)	908/2,000	0	--	--	Bagged	NAVSTA Landfill
5	Mercury (Kilograms/Pounds)	4.5/10	11/25 Pounds	Bottles	Optical Shop	--	Recommend recycle via DPDO
5	Plating Slugdes (Liters/Gallons)	227/60	19/5 Gallons	Pail	Plating Shop	--	Formerly Dry Well, Seep
2	Battery Acid (Liters/Gallons)	2,270/600	0	--	--	--	Poured on Coral Soil
2	Caustics (Liters/Gallons)	3,630/960	0	--	--	--	Drywell
5	Dilute Photographic Wastes (Liters/Gallons)	1,438/380	0	—	--	--	Stormdrain
1	Thinners, Solvents (Liters/ Gallons)	2,500/660	0	--	--	--	NAVSTA Landfill
5	Hypo Photographic Wastes (Liters/Gallons)	2,270/600	0	--	--	Silver Recovery	Leachfield
5	Other Dilute Photographic Wastes (Liters/Gallons)	1,135,500/ 300,000	0	--	--	--	Leachfield
1,5	Mixed Fuel, Hydraulic Fluid, Oil (Liters/Gallons)	4,542/1,200	376/100 Gallons	Bowser	OMD	--	Crashcrew Training
1,5	Mixed Fuel, Hydraulic Fluid, Oil (Liters/Gallons)	22,700/6,000	1,900/500 Gallons	Bowser	VQ1	--	Crashcrew Training
1,5	Mixed Fuel, Hydraulic Fluid, Oil	22,700/6,000	1,900/500 Gallons	Bowser	VQ3	--	Crashcrew Training
5	Oils (Liters/Gallons)	6,435/1,700	376/100 Gallons	Bowser	AIMD	--	Crashcrew Training
1,5	Solvents, Stripped, Cleaners (Liters/Gallons)	9,990/2,640	376/100 Gallons	Bowser	AIMD	--	Crashcrew Training
5	Hydraulic Fluid (Liters/Gallons)	2,500/660	376/100 Gallons	Bowser	AIMD	--	Crashcrew Training
5	Freon (Liters/Gallons)	681/180	376/100 Gallons	Bowser	AIMD	--	Crashcrew Training

Comments: (1) Hazard Categories:

1 - Flammable
2 - Corrosive
3 - Infectious
4 - Reactive
5 - Toxic

REFERENCES

1. State of Hawaii, Environmental Health Division, The Hawaii State Plan for Solid Waste Management, December 1971.

2. Solid Waste, Energy, and Resources Task Force, Solid Waste Energy/Resource Recovery in Hawaii, February 1976.

3. Hawaii State Department of Planning and Economic Development, The Economy of Hawaii - 1977 Annual Economic Report and Outlook, 1977.

4. Metcalf and Eddy, Inc., Solid Waste Management Plan for City and County of Honolulu, July 1971.

5. Letter from Jerry Johnson, Chairman of the Hawaii State Department of Health Advisory Committee on Hazardous Waste Disposal to Dr. Walter B. Quisenberry, Director of Health, February 8, 1974.

6. Honolulu-Pacific Federal Executive Board, Hazardous Waste Inventory, Disposal, and Practices, June 1974.

7. Hawaii Sub-Study Group, A Study of the Disposal of Hazardous/Toxic Waste Materials at Military Installations, Honolulu, Hawaii, April 1975.

8. Pollution Investigation and Enforcement Branch, Hawaii State Department of Health, Disposal of Wastes from Medical Facilities, May 1975 (internal report).

9. Booz-Allen Applied Research, Inc., A Study of Hazardous Waste Materials, Hazardous Effects, and Disposal Methods, Volumes I through III, July 1973 (NTIS No. PB-221-465; 466; 467).

10. Chamber of Commerce of Hawaii, Directory of Manufacturers, State of Hawaii, October 1975.

11. University of Hawaii, Pacific Biomedical Research Center, Hawaii Epidemiologic Studies Program, Annual Report No. 4-10, 1970-1976.

12. Department of Planning and Economic Development, The State of Hawaii Data Book, 1976.

13. TRW Systems Group, Recommended Methods of Reduction, Neutralization, Recovery, or Disposal of Hazardous Waste, Volumes I through XVI, August 1973 (NTIS No. PB-224-580 to 595).

14. Eastman Kodak Company, Disposal of Photographic Processing Effluents and Solutions, Standard Book No. 0-87985-063-9, 1973.

15. Personal Communication with Mr. Robert Stevens, California State Department of Health, Hazardous Waste Materials Section, Berkeley Office.

REFERENCES - (Continued)

16. J. Perkins and P. Chiu, Association of Bay Area Governments, Existing Authorities for Hazardous Waste Management, Draft, Technical Memorandum No. 2, June 13, 1977.

17. U. S. Environmental Protection Agency, Summary Materials for Public Meetings on Hazardous Waste Management Guidelines/Regulations Pursuant to Subtitle C, Resource Conservation and Recovery Act of 1976 (Public Law 94-588), 1977.

18. California State Department of Industrial Health, Berkeley Carcinogenic Office.

19. University of Arizona, Movement of Selected Metals, Asbestos, and Cyanide in Soil: Applications of Waste Disposal Problems, April 1977 (NTIS No. PB-266-905).

20. Battelle Memorial Institute, Program for the Management of Hazardous Wastes, Volumes I and II, 1974 (NTIS No. PB-233-631; 632).

21. Vector Control Section, California Department of Health, Berkeley, California, Vector News, Volume 22, No. 2, February 1975.

22. Sanborn, et al, The Degradation of Selected Pesticides in Soil: A Review of the Published Literature, August 1977 (EPA No. 600/9-77-022).

23. U. S. Environmental Protection Agency, Landfill Disposal of Hazardous Wastes: A Review of the Literature and Known Approaches, June 1975 (EPA No. 530/SW-165).

24. The Office of Samoan Information, American Samoa Annual Report to the Secretary of the Interior, Fiscal Year 1976.

25. Maier, Gerald and Russell, Scott, Saipan Solid Waste Disposal, Office of the District Planner, Marianas Islands District, June 9, 1975.

26. Townsend, Terry, Residential Solid Waste Collection - Report and Recommendations, District Planning Office, Marianas Islands District, August 14, 1975.

27. Office of Transition Studies and Planning, Socioeconomic Development Plan for the Northern Marianas Islands, 1978-85, October 1977.

28. John Reindl, "Waste Oil Recycling," Journal of Environmental Health, July/August 1977.

29. Young, R. H. F., et al, A Solid Waste Management Plan for Truk, Ponape, and Majuro (First Draft), Honolulu, Hawaii, March 1977.

REFERENCES - (Continued)

30. California State Water Resources Control Board, Disposal Site Design and Operation Information.

31. Batelle Memorial Institute, Program for the Management of Hazardous Wastes for Environmental Protection Agency, Office of Solid Waste Management Programs, Washington, D. C., July 1977.

32. Powers, Philip W., How to Dispose of Toxic Substances and Industrial Wastes, Noyes Data Corporation, Park Ridge, New Jersey, 1976.

33. California State Solid Waste Management Board, Disposal of Environmentally Dangerous Wastes in California, August 1976.

34. Office of Solid Waste Management Programs, Decision-Makers' Guide in Solid Waste Management, U. S. Environmental Protection Agency Publication SW-500, 1976.

35. U. S. Environmental Protection Agency, Air Pollution Emergency Manual, Publication AP-40.

36. Air Pollution Control Association, Oregon-Washington Incinerator Committee Standard, August 31, 1970.

37. Garretson•Elmendorf•Zinov•Reibin, Architects and Engineers, Specifications for Installation of a New Pathologic Incinerator and Related Building Alteration Work for Washington State University, Pullman, Washington, May 1977.

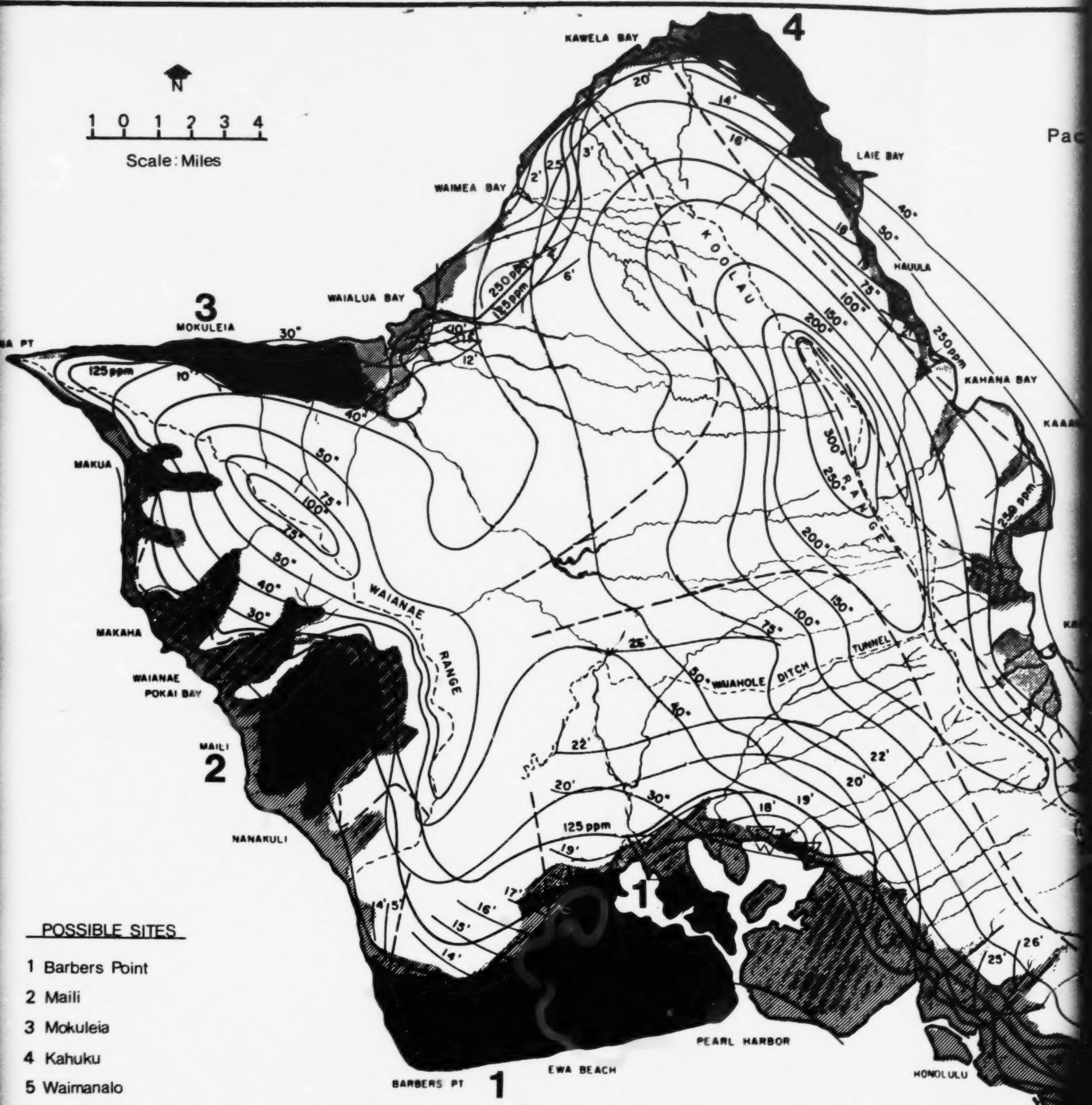
38. Incinerator Institute of America, Incinerator Standards, New York, New York, November 1968.

39. Hawaii Sub-study Group, A Study of the Disposal of Hazardous/Toxic Materials at Military Installations, Honolulu, Hawaii, April 1975.

40. Kelley, T. C., Letter Dated March 6, 1978, Department of the Navy, Pacific Division Naval Facilities Engineering Command, Pearl Harbor, Hawaii.

41. Ova, O. E., Letter Dated December 2, 1977, Department of the Army, Ballistic Missile Defense Systems Command, Huntsville, Alabama.

42. Reeve, J. H., Letter Dated March 3, 1978, Department of the Army, Ballistic Missile Defense Systems Command, Huntsville, Alabama.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Scale: Miles
Pac
KAWELA BAY
4
LAIE BAY
WAIMEA BAY
HAUULA
KOOLAU RANGE
WAIALUA BAY
3
MOKULEIA
KAHANA BAY
KAAA
MAKUA
WAIANAE RANGE
MAKAHA
WAIANAE
POKAI BAY
WAIAHOLE DITCH TUNNEL
MAILI
2
NANAKULI
125 ppm
250 ppm
POSSIBLE SITES
1 Barbers Point
2 Maili
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4 Kahuku
5 Waimanalo
PEARL HARBOR
EWA BEACH
BARBERS PT
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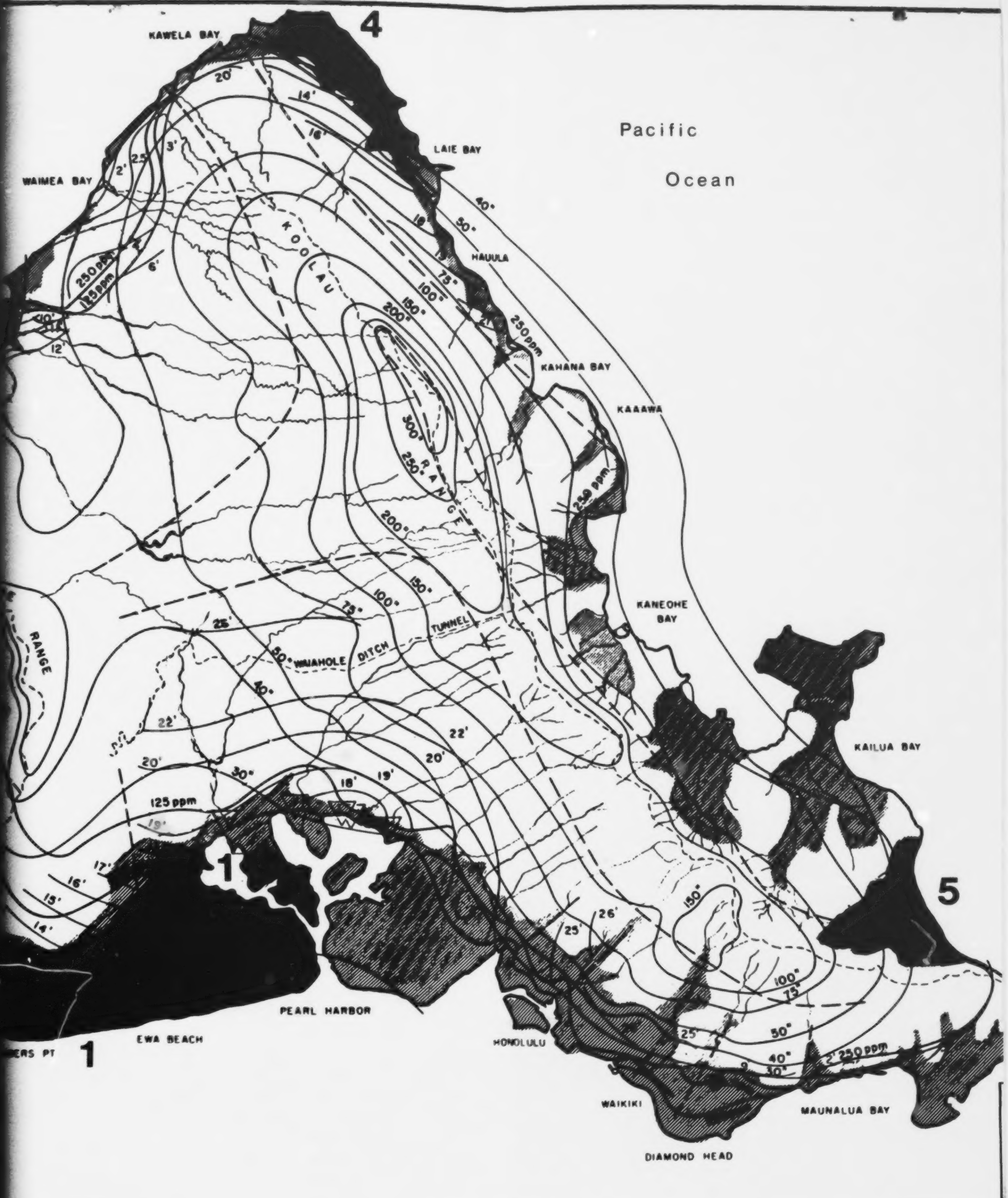
HONOLULU
WAIKIKI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KOOLAU RANGE
250 ppm
125 ppm
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KAAAWA
KANEOHE BAY
RANGE
WAIAHOLE DITCH TUNNEL
KAILUA BAY
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PEARL HARBOR
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1
HONOLULU
WAIKIKI
MAUNALUA BAY
DIAMOND HEAD
300"
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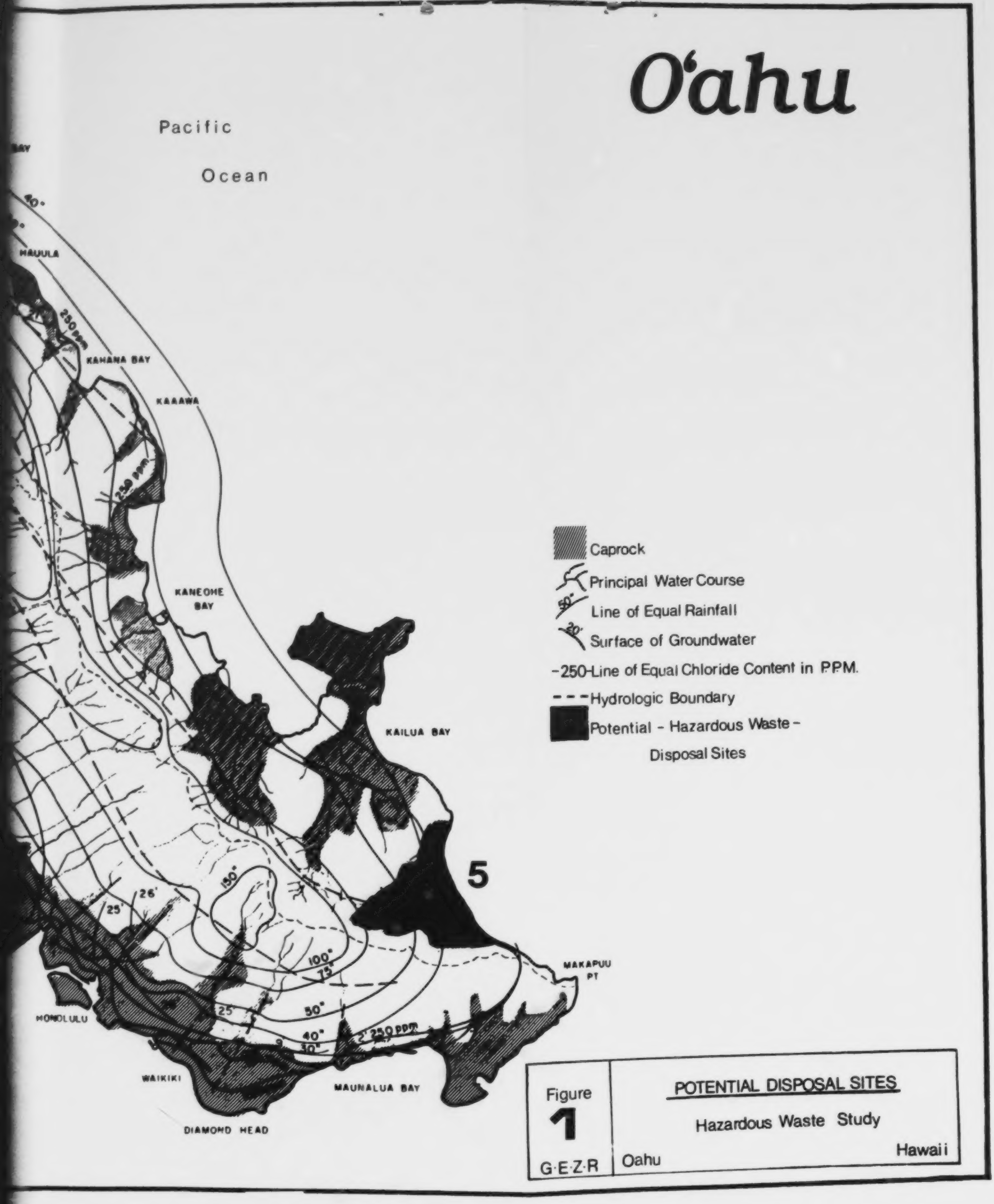
22'
19'
18'
26'

1/75


O'ahu
Pacific
Ocean
HAUULA
250 ppm
KAHANA BAY
KAAAWA
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KAILUA BAY
5
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25'
100"
75"
50"
40"
30"
25'
9
2' 250 ppm
HONOLULU
WAIKIKI
DIAMOND HEAD
MAUNALUA BAY
MAKAPUU PT
▨ Caprock
Principal Water Course
50" Line of Equal Rainfall
20' Surface of Groundwater
-250- Line of Equal Chloride Content in P.P.M.
- - - Hydrologic Boundary
■ Potential - Hazardous Waste - Disposal Sites

Figure
1
G·E·Z·R

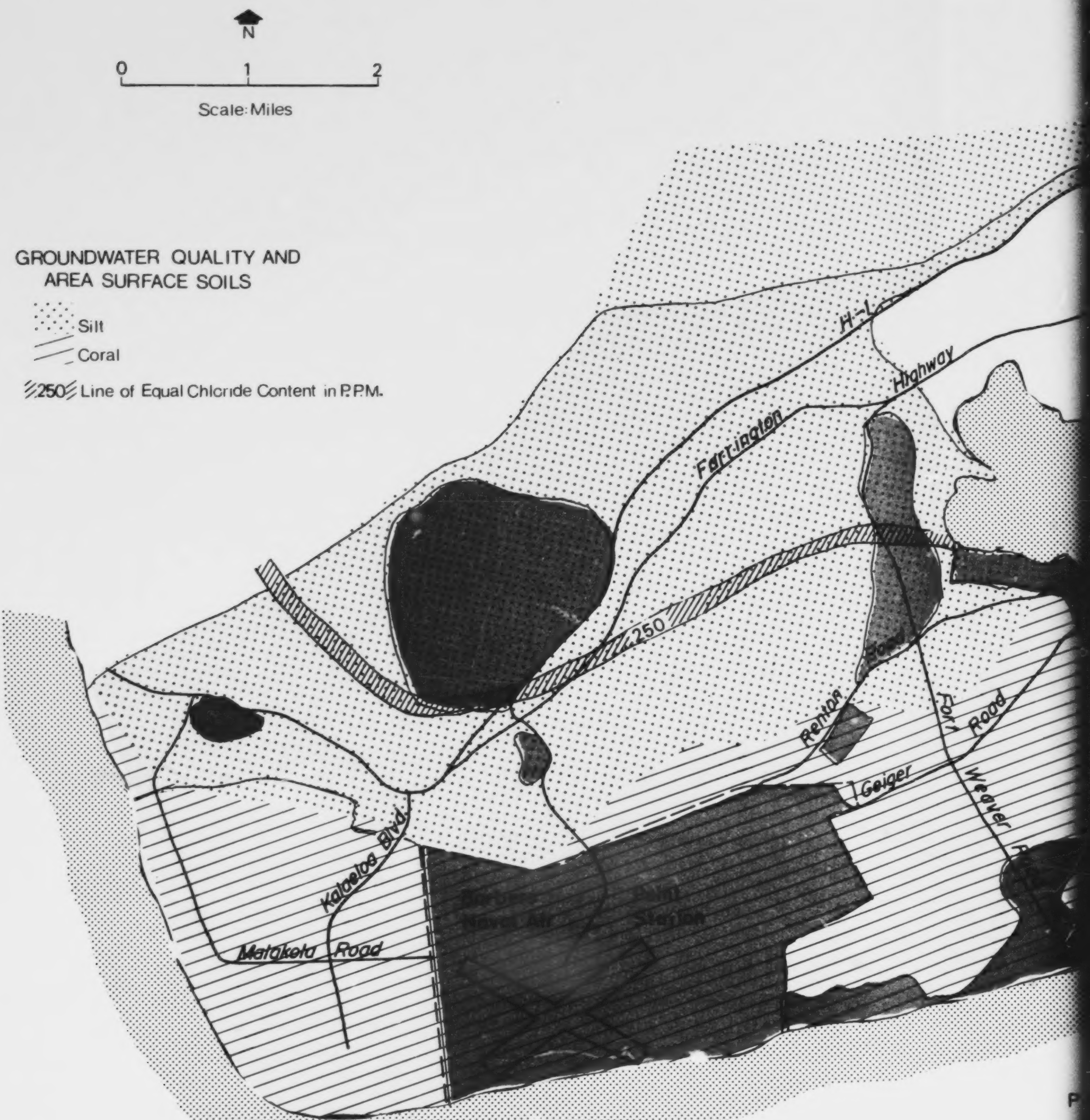
POTENTIAL DISPOSAL SITES

Hazardous Waste Study

Oahu

Hawaii

1/75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GROUNDWATER QUALITY AND
AREA SURFACE SOILS
Silt
Coral
250 Line of Equal Chloride Content in P.P.M.
H-1
Highway
Farrington
250
Renton
Road
Fort
Weaver
Road
Geiger
Road
Kalaeloa Blvd.
Makakilo Road
Barbers Point
Naval Air Station

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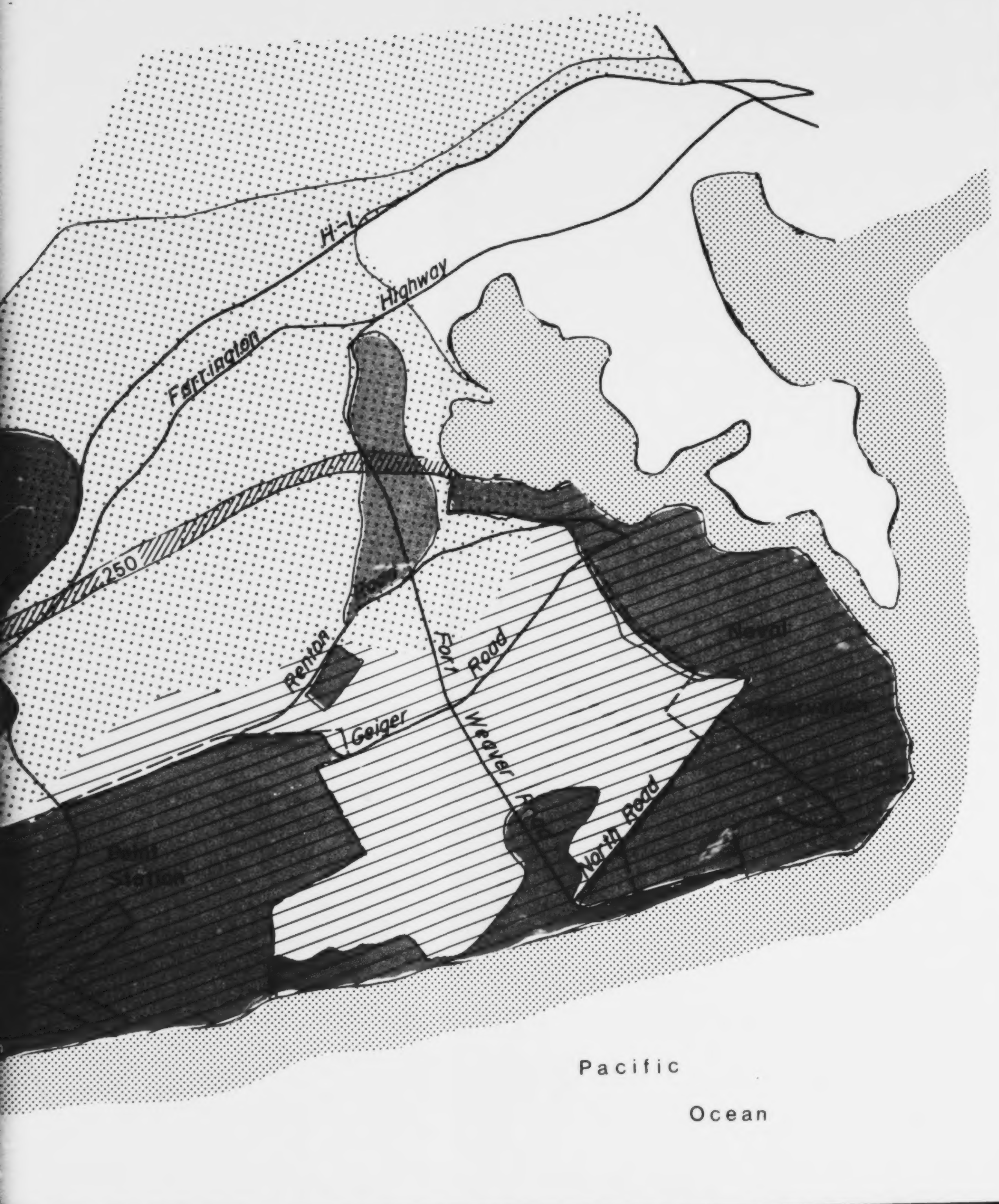
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Farrington
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Road
Fort
Road
Geiger
Weaver
Road
North Road
Naval
Point
Station
Pacific
Ocean

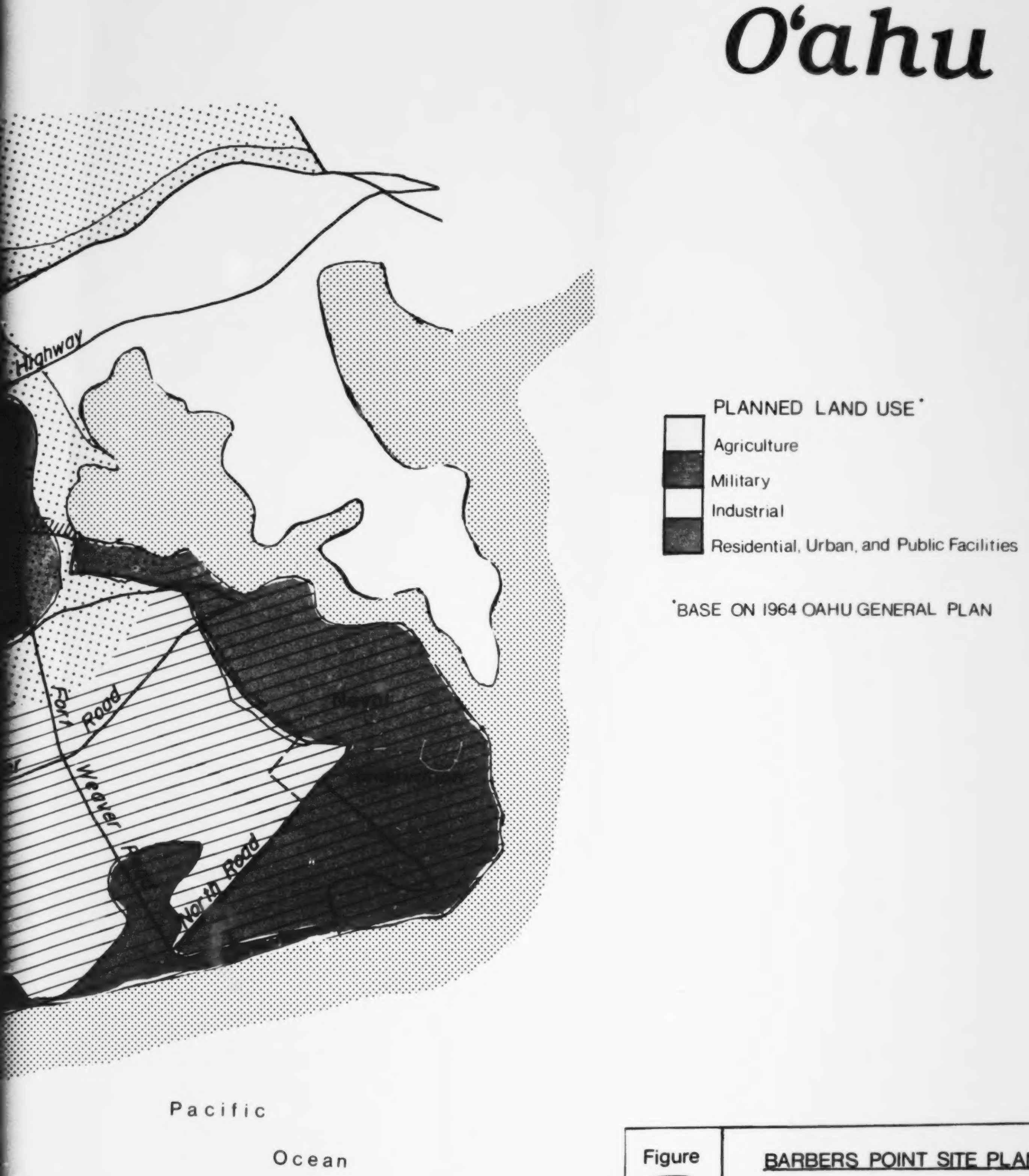

O'ahu
Highway
Fort Road
Weaver Road
North Road
Naval
PLANNED LAND USE*
Agriculture
Military
Industrial
Residential, Urban, and Public Facilities
*BASE ON 1964 OAHU GENERAL PLAN
Pacific
Ocean

Figure 2

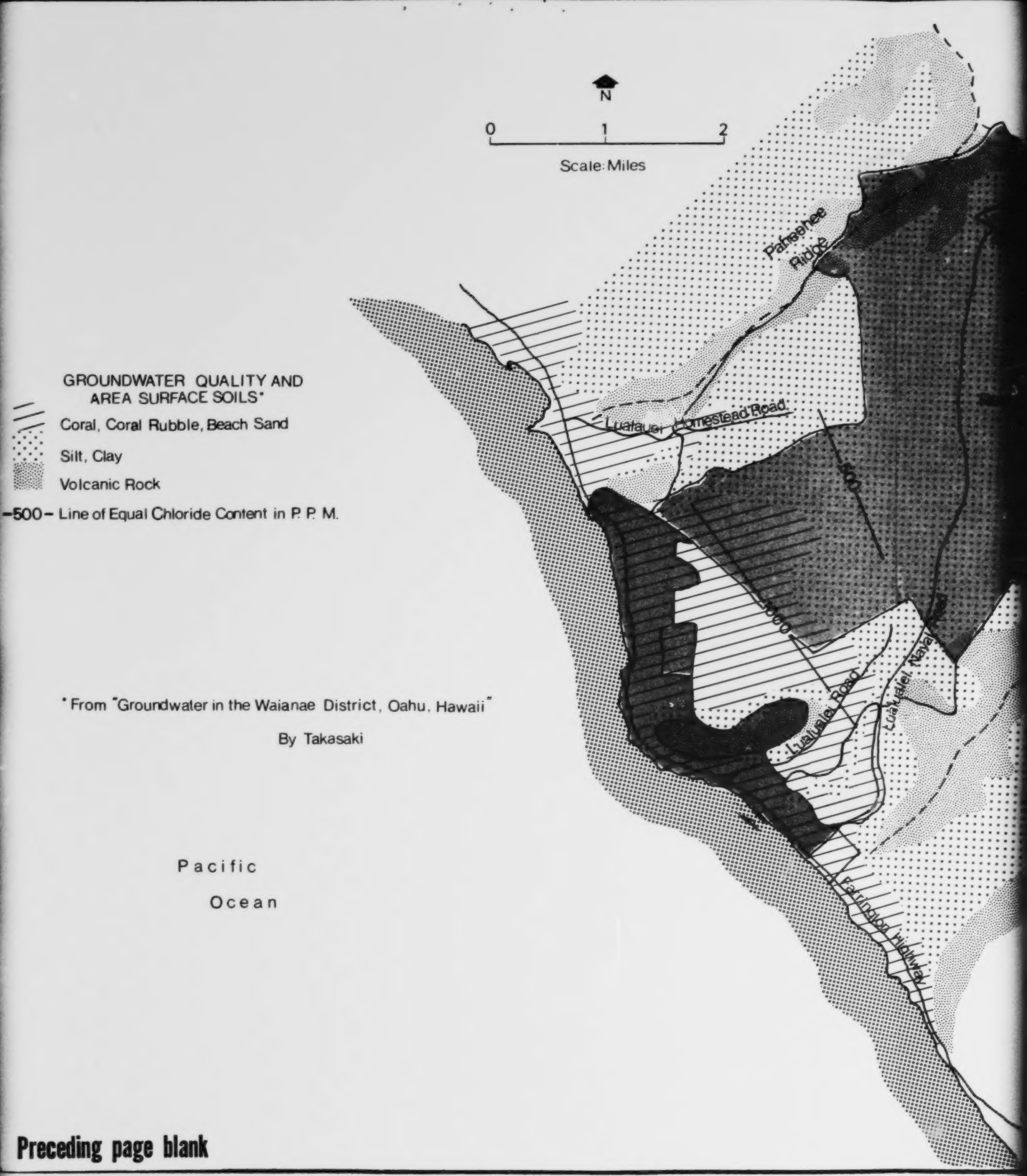
G·E·Z·R

BARBERS POINT SITE PLAN

Hazardous Waste Study

Oahu Hawaii

1/77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Paheehee Ridge
Lualualei Homestead Road
500
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Lualualei Road
Lualualei Naval Road
Farrington Highway
Pacific Ocean
GROUNDWATER QUALITY AND AREA SURFACE SOILS*
Coral, Coral Rubble, Beach Sand
Silt, Clay
Volcanic Rock
-500- Line of Equal Chloride Content in P. P. M.

* From "Groundwater in the Waianae District, Oahu, Hawaii"
By Takasaki

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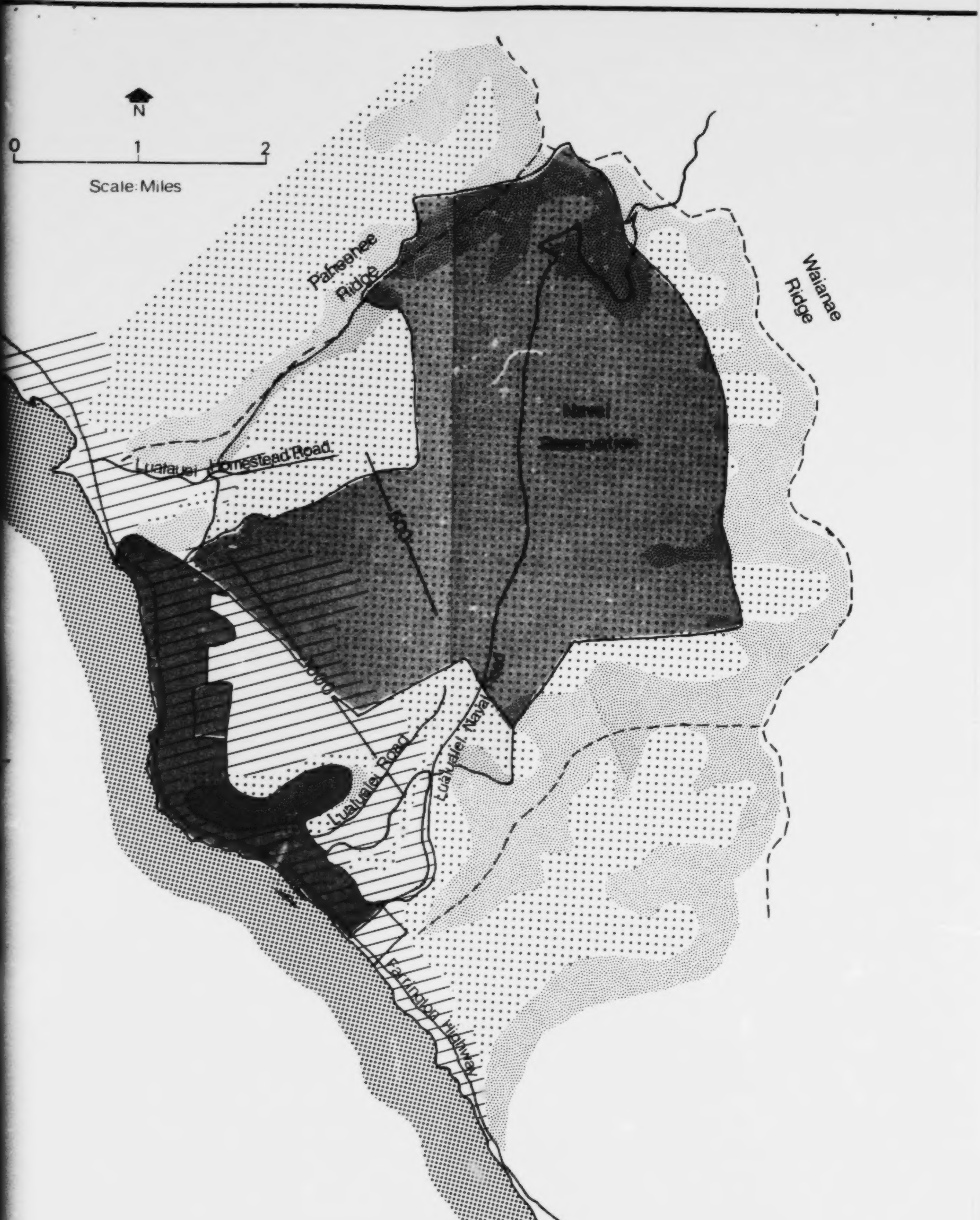
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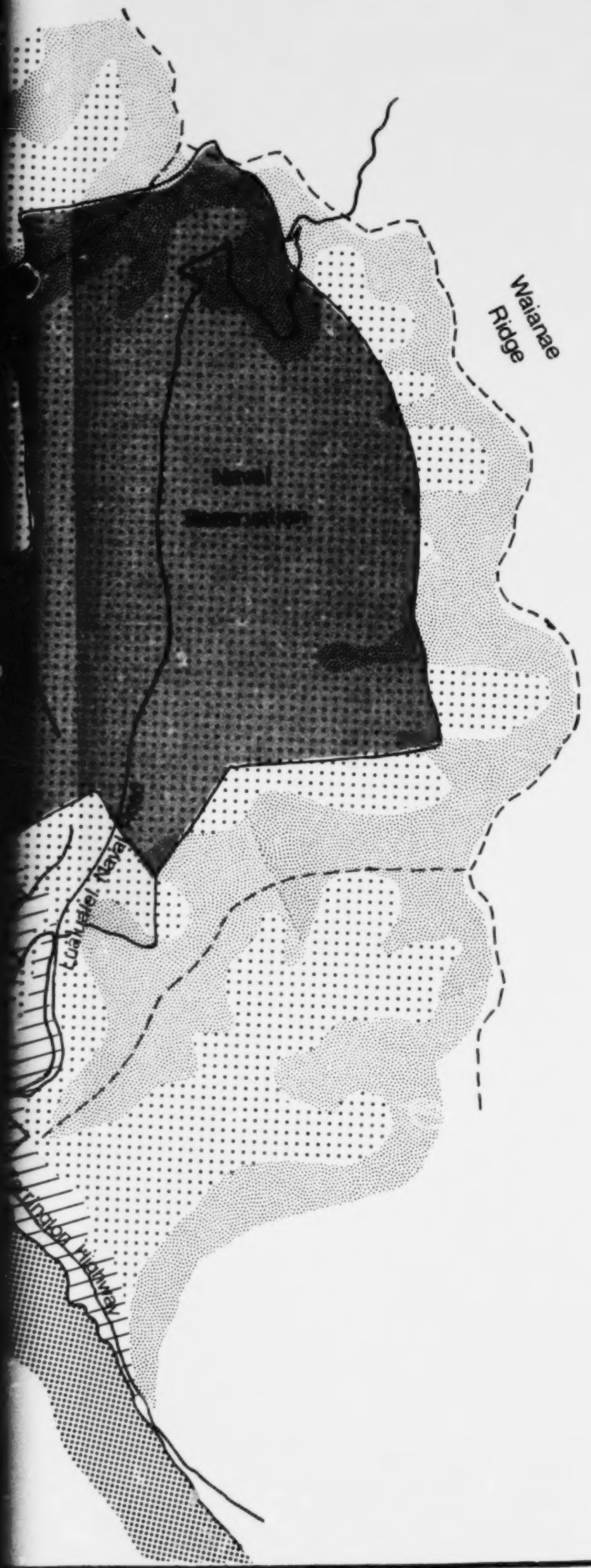
Scale: Miles
Paheehee Ridge
Waianae Ridge
Naval Reservation
Lualualei Homestead Road
600'
1000'
Lualualei Road
Lualualei Naval Road
Farrington Highway

O'ahu


Waianae Ridge
Naval Reservation
Lualualei Naval
rington Highway

PLANNED LAND USE*

Agriculture

Military

Industrial

Residential, Urban, and Public Facilities

* BASE ON 1964 OAHU GENERAL PLAN

Figure

3

G·E·Z·R

MAILI SITE PLAN

Hazardous Waste Study

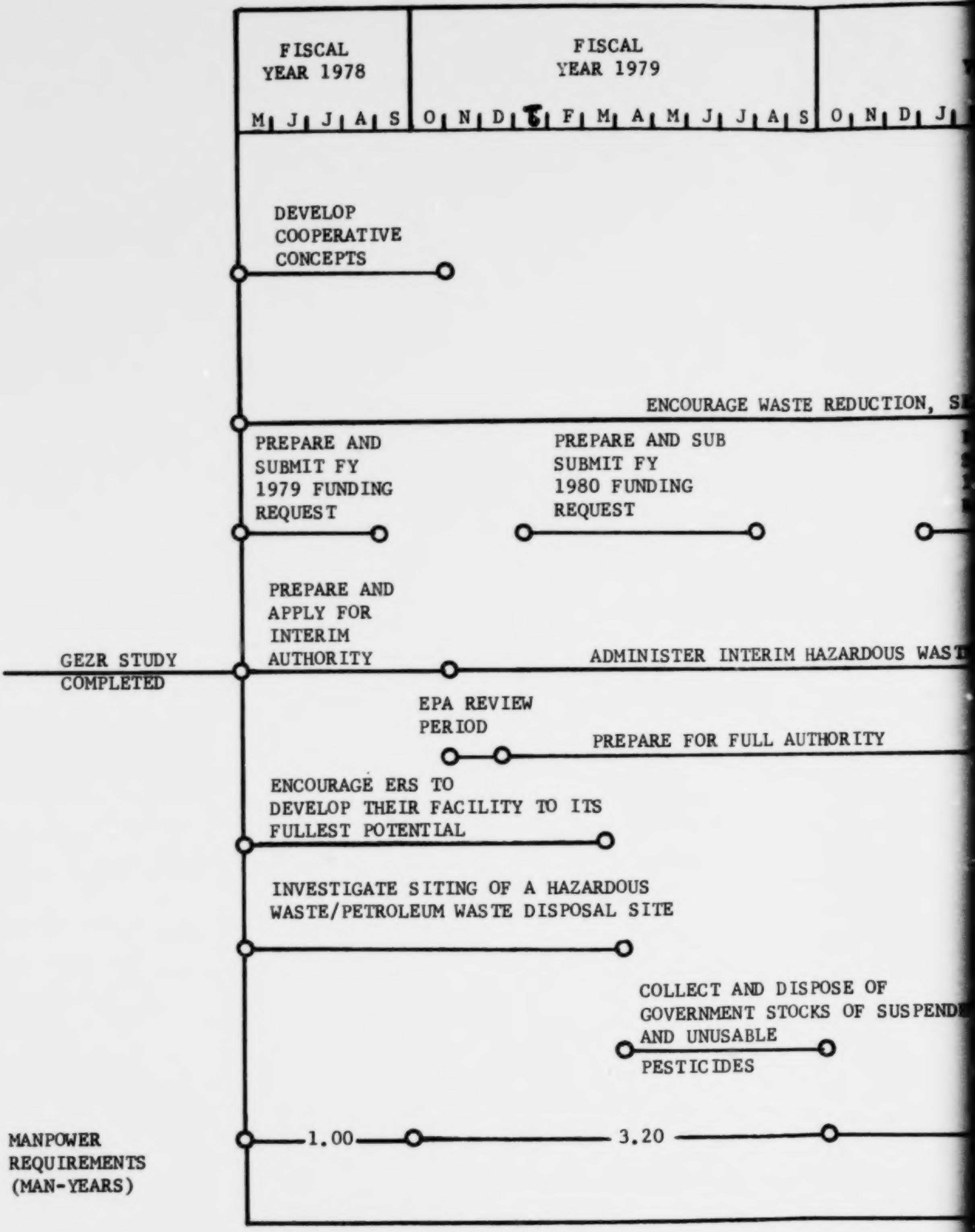
Oahu

Hawaii

1/79

FIGURE 4

SCHEDULE OF STRA


FISCAL YEAR 1978
M J J A S
FISCAL YEAR 1979
O N D J F M A M J J A S
O N D J
DEVELOP COOPERATIVE CONCEPTS
ENCOURAGE WASTE REDUCTION, S
PREPARE AND SUBMIT FY 1979 FUNDING REQUEST
PREPARE AND SUB SUBMIT FY 1980 FUNDING REQUEST
GEZR STUDY COMPLETED
PREPARE AND APPLY FOR INTERIM AUTHORITY
ADMINISTER INTERIM HAZARDOUS WAST
EPA REVIEW PERIOD
PREPARE FOR FULL AUTHORITY
ENCOURAGE ERS TO DEVELOP THEIR FACILITY TO ITS FULLEST POTENTIAL
INVESTIGATE SITING OF A HAZARDOUS WASTE/PETROLEUM WASTE DISPOSAL SITE
COLLECT AND DISPOSE OF GOVERNMENT STOCKS OF SUSPEND AND UNUSABLE PESTICIDES
MANPOWER REQUIREMENTS (MAN-YEARS)
1.00
3.20

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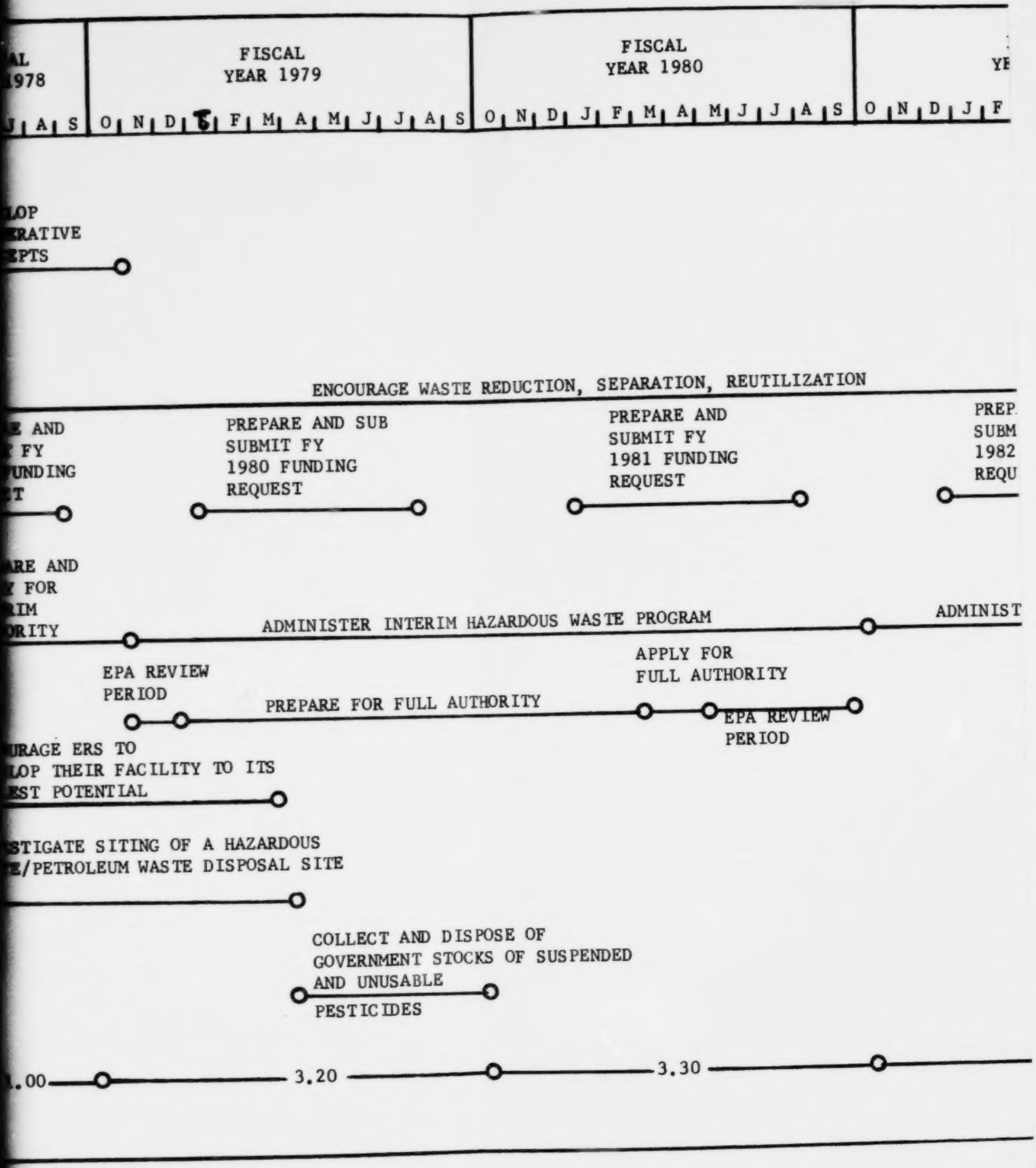
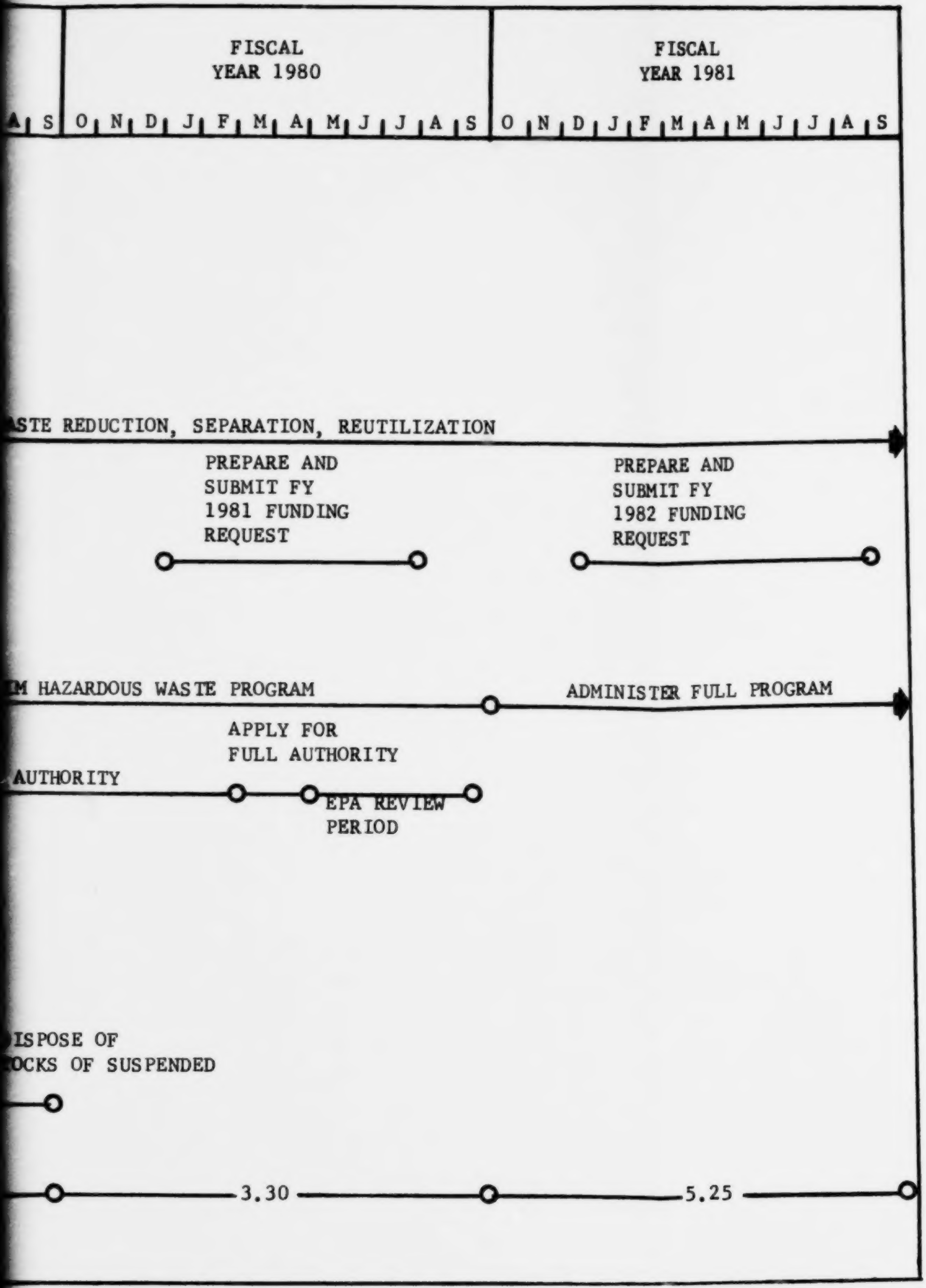
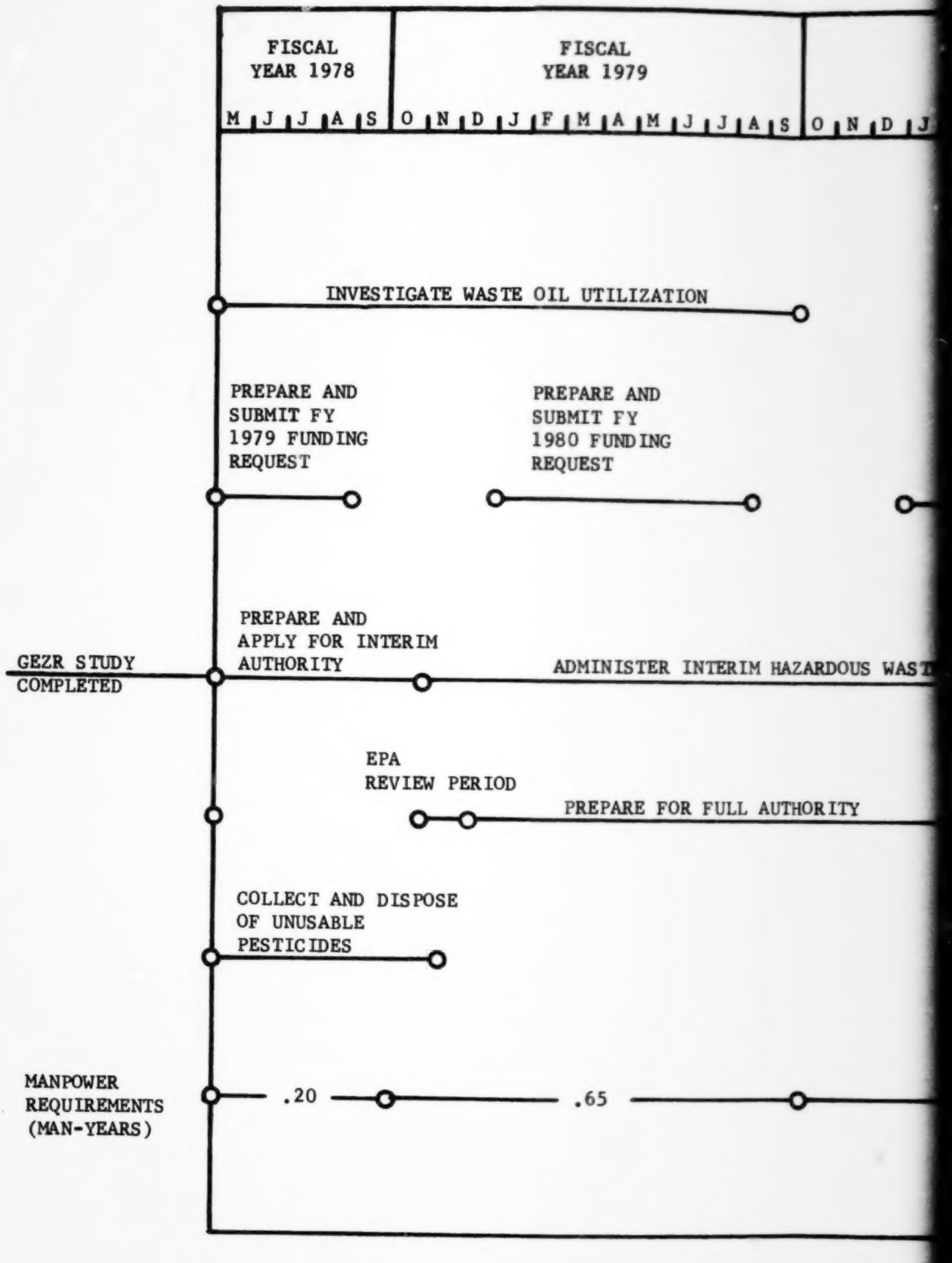
SCHEDULE OF STRATEGY TASKS



SCHEDULE OF STRATEGY TASKS



SCHEDULE OF ST


FISCAL YEAR 1978
FISCAL YEAR 1979
M J J A S
O N D J F M A M J J A S
O N D J
INVESTIGATE WASTE OIL UTILIZATION
PREPARE AND SUBMIT FY 1979 FUNDING REQUEST
PREPARE AND SUBMIT FY 1980 FUNDING REQUEST
GEZR STUDY COMPLETED
PREPARE AND APPLY FOR INTERIM AUTHORITY
ADMINISTER INTERIM HAZARDOUS WAS
EPA REVIEW PERIOD
PREPARE FOR FULL AUTHORITY
COLLECT AND DISPOSE OF UNUSABLE PESTICIDES
MANPOWER REQUIREMENTS (MAN-YEARS)
.20
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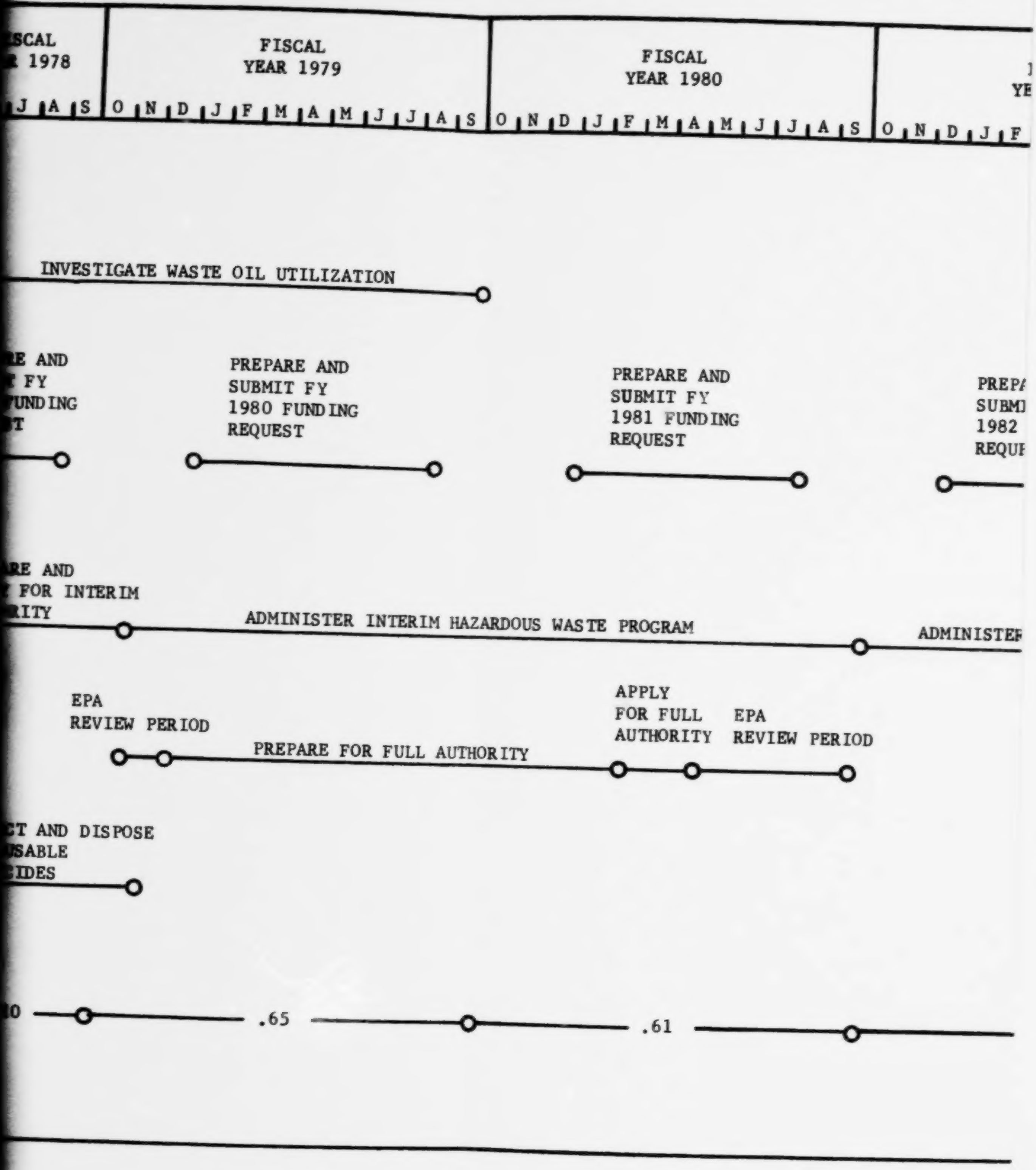
SCHEDULE OF STRATEGY TASKS



SCHEDULE OF STRATEGY TASKS

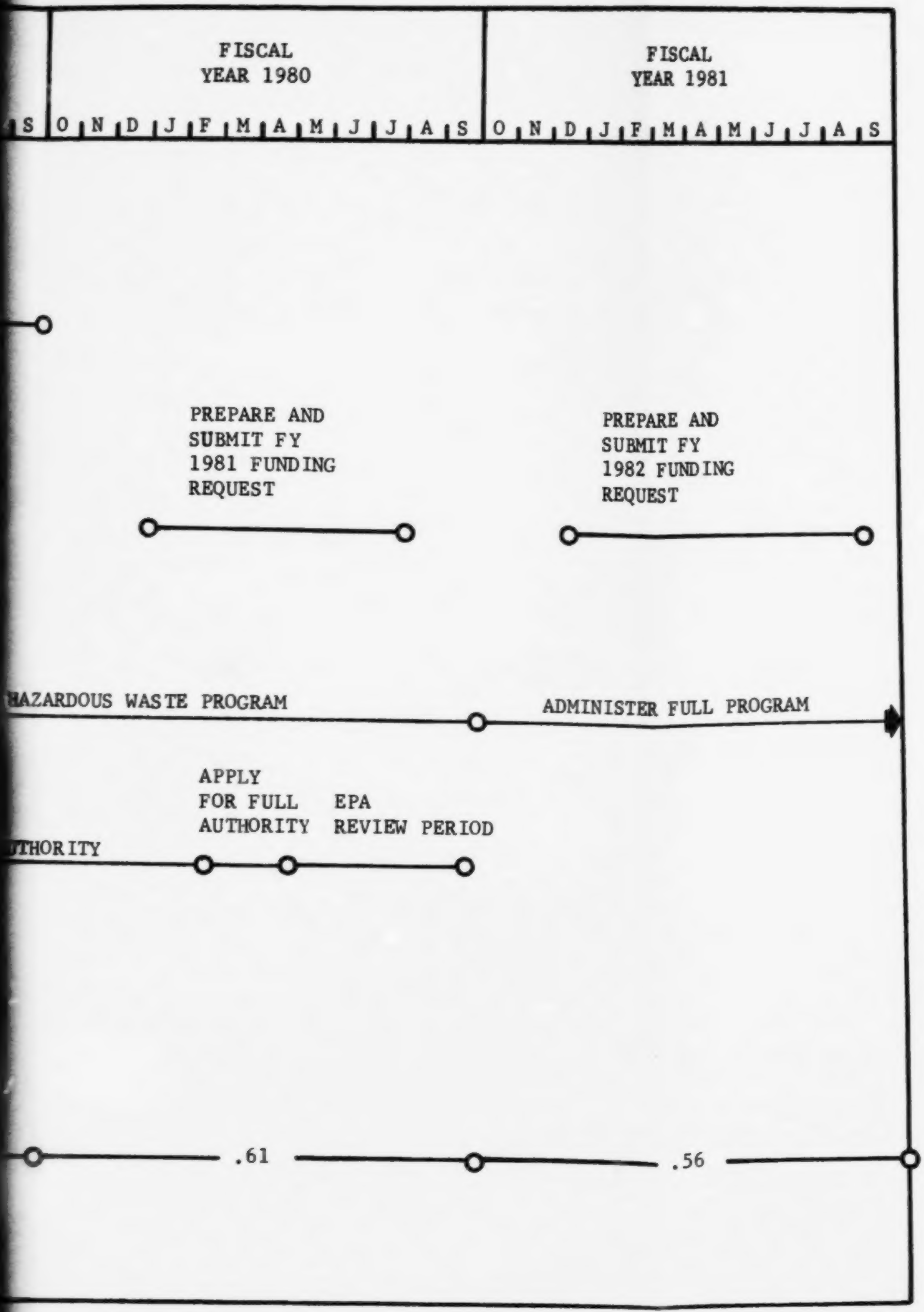
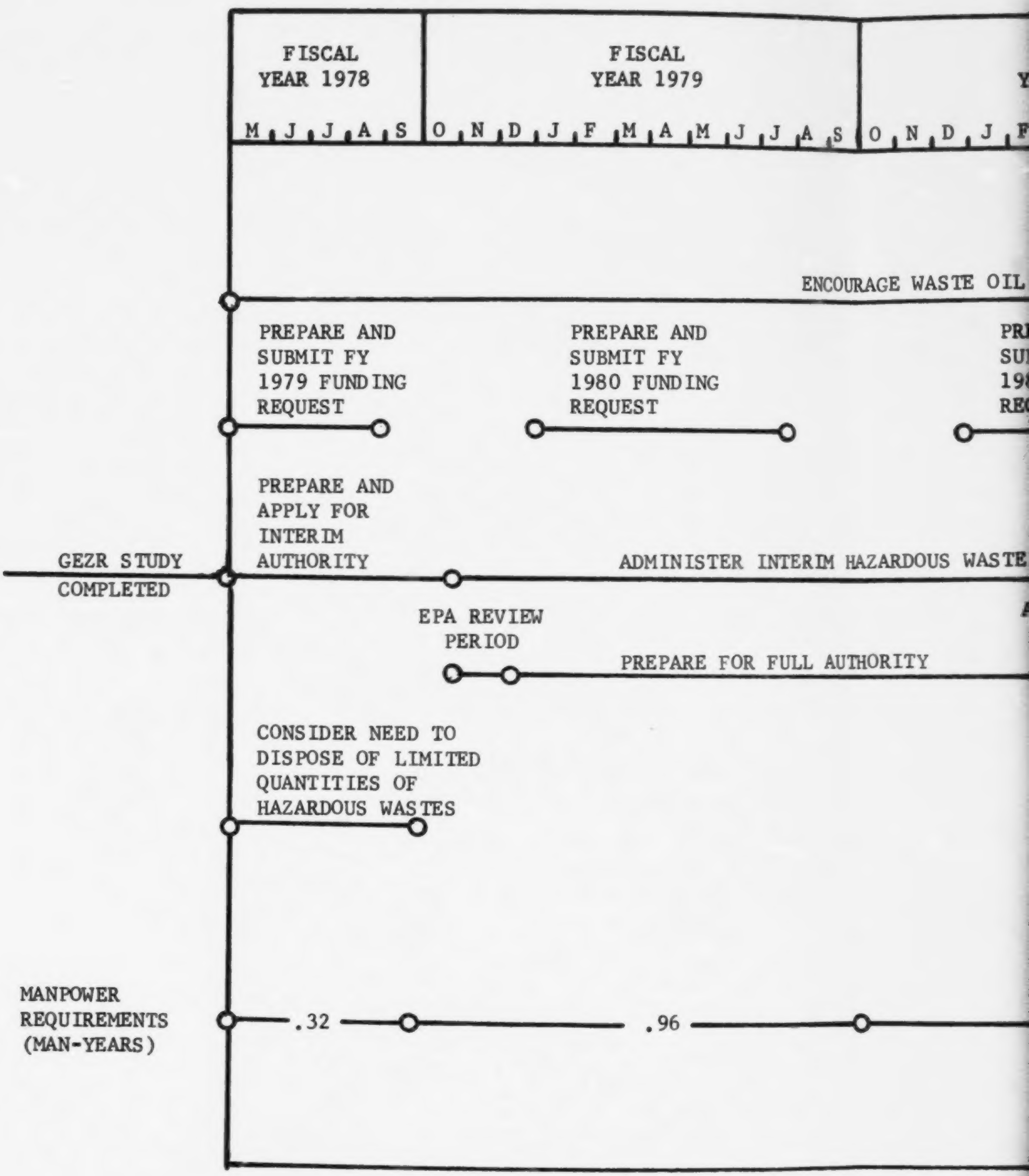


FIGURE 2-1 SCHEDULE OF STRATEGY TASKS


FISCAL YEAR 1978
FISCAL YEAR 1979
Y
M J J A S
O N D J F M A M J J A S
O N D J F
ENCOURAGE WASTE OIL
PREPARE AND SUBMIT FY 1979 FUNDING REQUEST
PREPARE AND SUBMIT FY 1980 FUNDING REQUEST
PRE SUB 198 REQ
PREPARE AND APPLY FOR INTERIM AUTHORITY
GEZR STUDY COMPLETED
ADMINISTER INTERIM HAZARDOUS WASTE
EPA REVIEW PERIOD
PREPARE FOR FULL AUTHORITY
CONSIDER NEED TO DISPOSE OF LIMITED QUANTITIES OF HAZARDOUS WASTES
MANPOWER REQUIREMENTS (MAN-YEARS)
.32
.96

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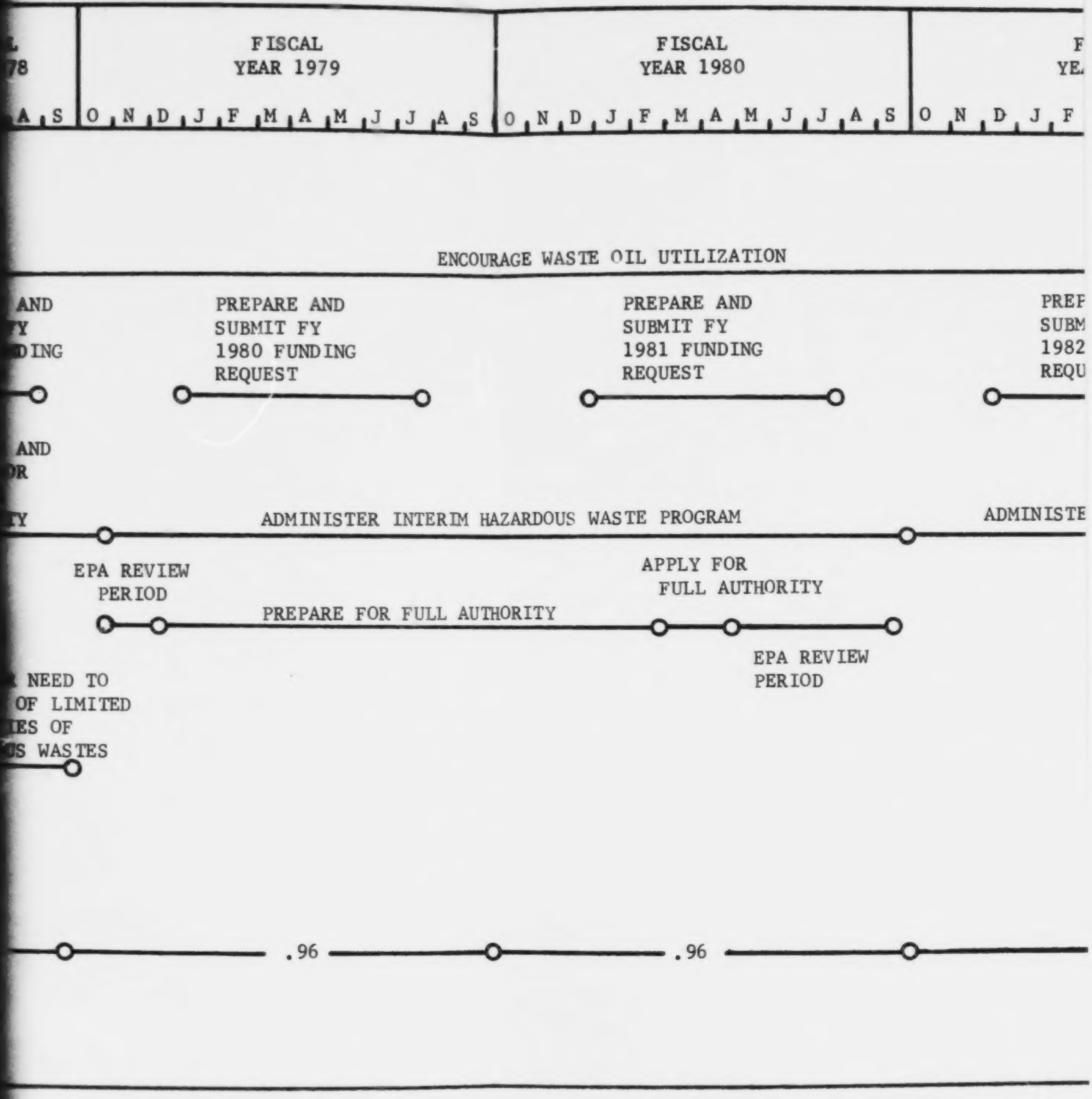
1 SCHEDU̇ᴸᴱ OF STRATEGY TASKS



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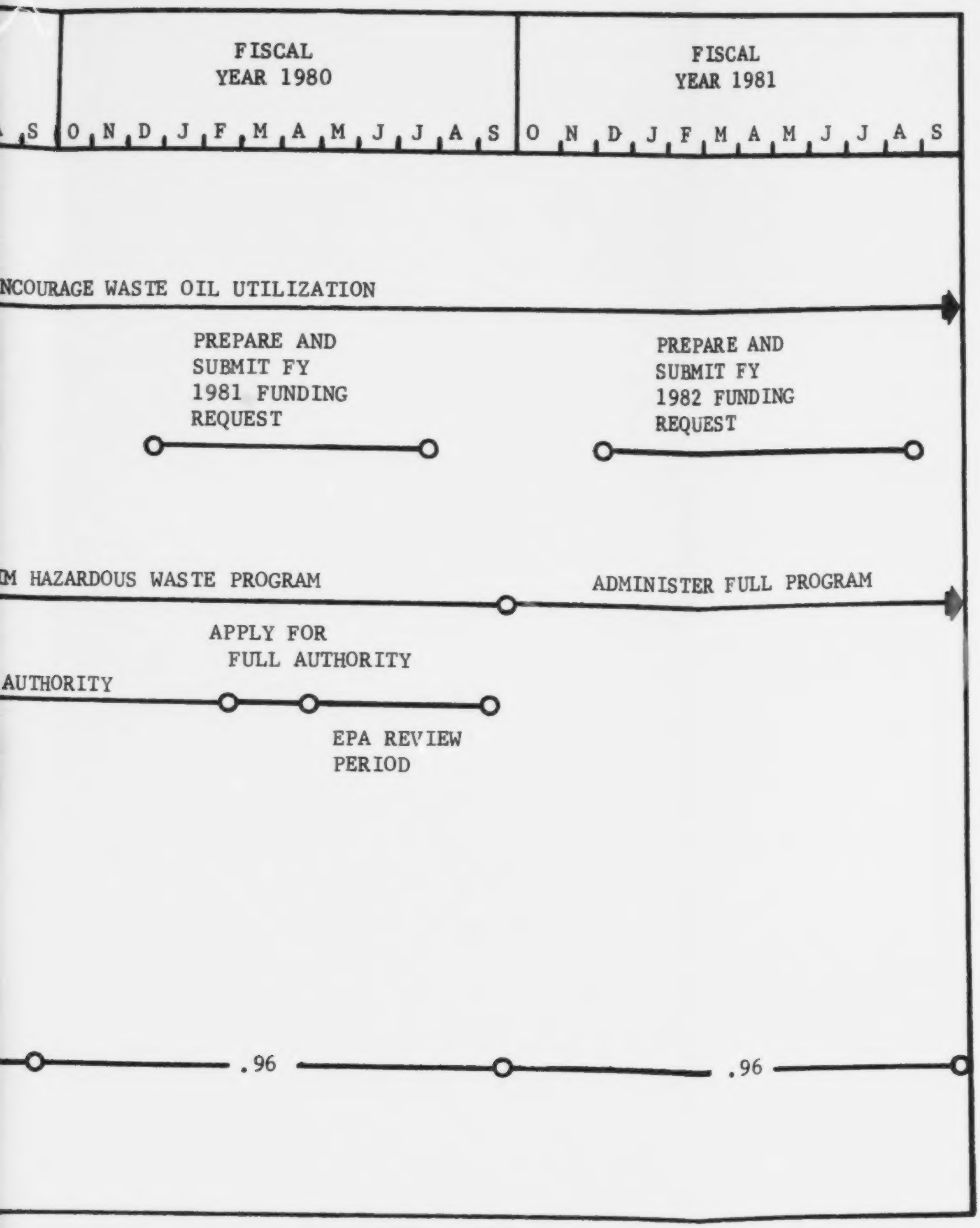
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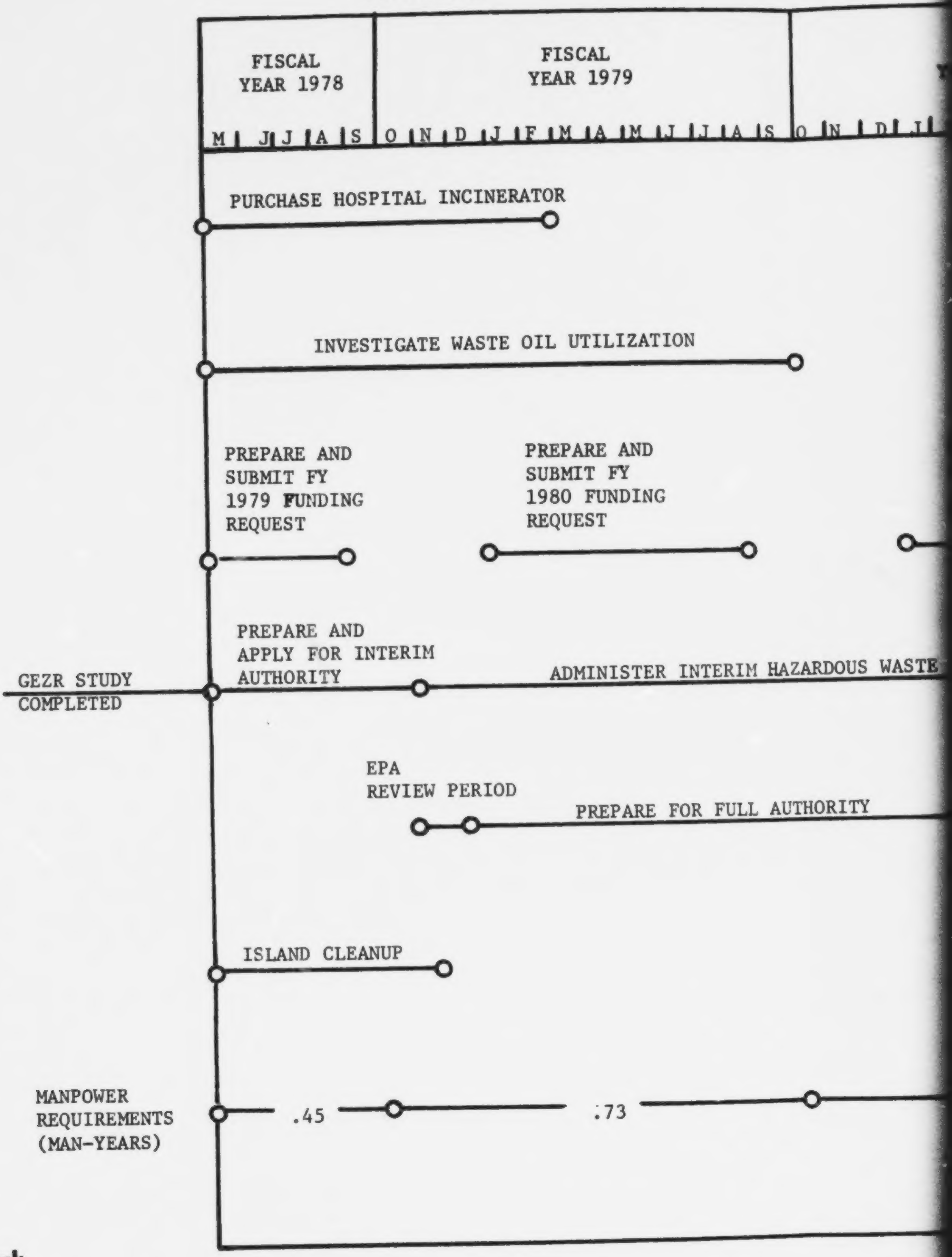
SCHEDULE OF STRAT

FIGURE 4-1



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SCHEDULE OF STRATEGY TASKS

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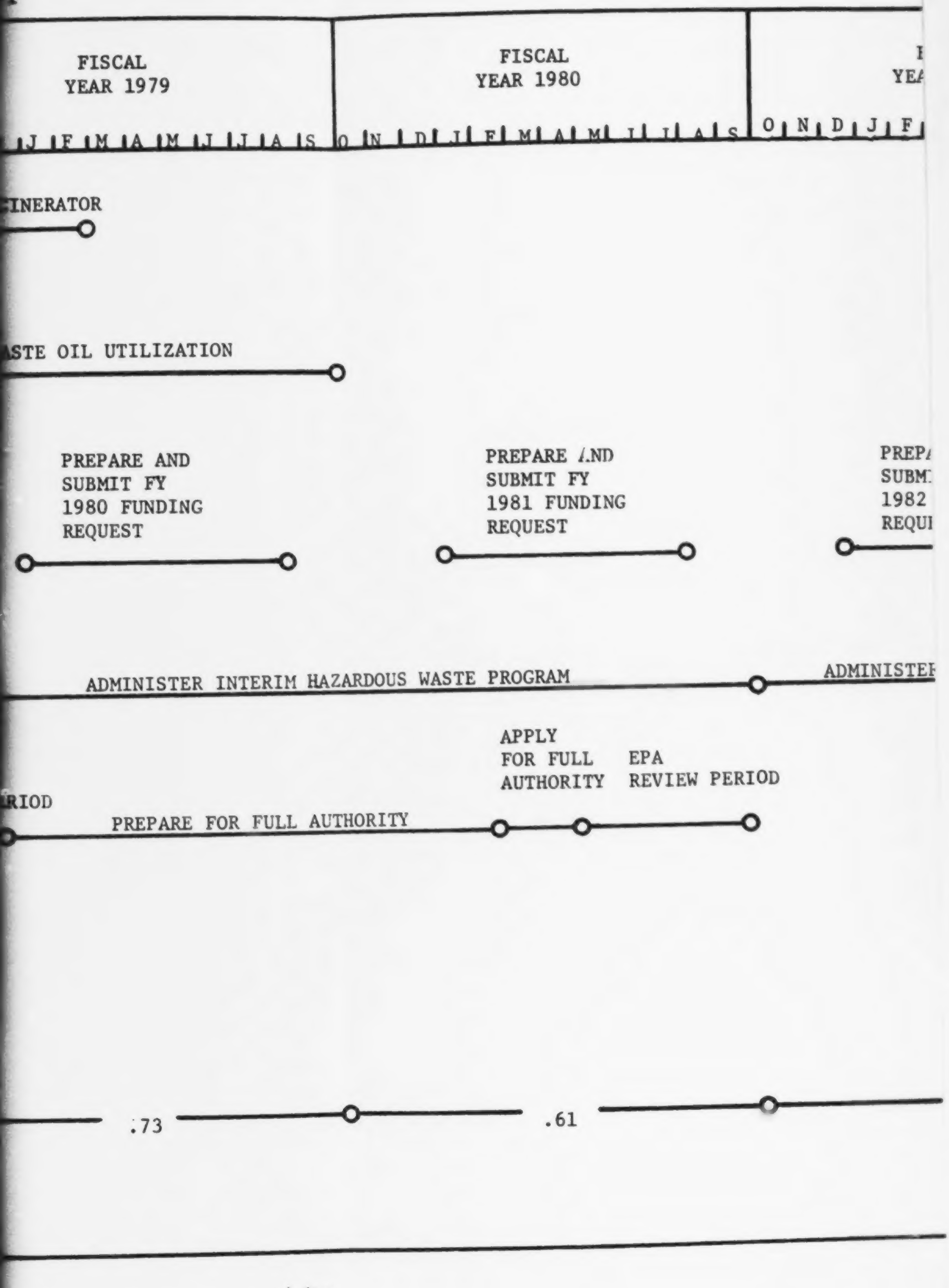

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CHEDULE OF STRATEGY TASKS